RAILROAD GAZETTE

YOUNG RUNNERS FOR FAST TRAINS.

There ought to be an age limit beyond which enginemen should not be employed on fast trains, and perhaps not on any main line train. It would be difficult to fix the limit, so as to secure agreement upon it, even among the officers of a single large road, and it would be an unpleasant thing to enforce, at least until it got established, as has the age-limit among officers in the army; but the subject is brought to mind by a remark made by President Mellen, of the New York, New Haven & Hartford, when addressing a meeting of conductors at New Haven recently. A New Haven paper quotes:

"I do not think that ambitious and energetic young men should have their path blocked by a rule that places above them men who are in many instances not so capable. I have no prejudice against old men, but I do not think that the seniority rule should be ironclad. If we ever have a four-hour train between New York and Boston, as I hope that we shall, I do not want the oldest conductor and engineer on the road to handle it." Continuing, Mr. Mellen said, in reference to appeals from the Grievance Committee, that in many instances these were brought where they could do no good, and were not important. If only the cases in which the men had good causes were brought, they would receive better attention.

The seniority rule is *not* ironclad. Mr. Mellen does not say that it is; but other presidents have said so, or at least have taken pains to convey that impression when giving their views on the causes of collisions. By the usual regulations or agreements, seniority is to govern promotions, but with the important proviso, "other things being equal"; and when a man 55 years old, who has been in the service 30 years, is less desirable for an important run than one 50 years old, who has served only 25 years, it is the duty of the superintendent to establish that fact and promote the younger man. The *Railroad Gazette* has preached this doctrine but has found few to practice it systematically; and it is a good sign to have a president speak plainly on the subject. Of course, no one finds fast engines manned by men obviously superannuated; the trouble lies in dealing with the border line between efficiency and inefficiency; in the disinclination of timid superintendents to act at the proper time in each individual case. Most superintendents will smile when they read that word "timid," but does it not in this case fit a good many men who in other matters are firm? Where there is a doubt about the fitness of a man who is getting too old, the public and the company should have the benefit of the doubt; but after listening to the plea of the Grievance Committee the superintendent gives it to the engineman—knowing that such action means taking a risk. It is, indeed, difficult to settle conflicting interests where the margin is as narrow as in the case supposed above (between 50 years and 55 years); but the difficulty does not excuse evasion of the duty. The fact that it is hard to settle such cases by balancing the facts is a good reason for establishing an arbitrary rule. It requires courage and a firm policy to do this, but it is only by arbitrary rules that we are able to settle half the important questions of life.

To provide for the elasticity that is desirable even in administering arbitrary rules, and to fortify himself with facts to justly settle cases which will arise before an arbitrary rule can be established, the wise superintendent will keep a detailed record of each man's conduct and efficiency and will cultivate the acquaintance of his men. These are trite precepts, but conditions seem to indicate that they will bear repeating. Some things we must assume: for instance, a superintendent who is clear-headed, who not only has the right sense of justice but the courage to carry it out in his acts; and a management above him who will support his decisions. These conditions secured, the best backing for a decision putting a young man ahead of an older one is a convincing showing that he has really been ahead of him, so far as qualifications are concerned, for some years already. The right kind of records kept by a conscientious superintendent will do this.

It is to be hoped that "Boss Grievers" everywhere will take to heart the last part of what Mr. Mellen said. That was a polite way of telling the New Haven committees that they come to headquarters so often that they make the officers tired. It is one of the hard facts of business life that the most amiable railroad manager in the world cannot afford to spend his time on matters of second rate importance, and grievance committees have got to recognize this hard fact, as other people do. A superintendent who desires to be friendly, patient and familiar with his subordinates is forced to deny himself that pleasure, by the pressure of his work. When an officer keeps his callers waiting an hour and then gives them only 15 minutes (when they want an hour), it is usually because he is unable to find any other way to get his day's work done, not because he likes to freeze his friends.

Brotherhood committee men who have no important grievances to occupy their energies, but who yet must keep themselves promiment, ought to establish saints' days, and have celebrations; and the first saint should be Saint Arthur. Mr. Arthur always saw the essentials, and devoted his attention to them; and was willing to treat a "magnate" as an equal.

STEEL vs. WOODEN CARS.

The paper on steel cars, read before the New England Railroad Club, which is printed elsewhere in this issue, presents broad claims as to the advantages of this type of construction and offers a general refutation of the alleged disadvantages. The author, who represents a large builder of steel cars, will naturally be taken as a prejudiced investigator, and some of the data on which he bases his statements are certainly open to question; nevertheless, the subject is one of vital interest, and the paper is worthy of attention. It attempts to show that cars built entirely of metal or with metal underframes, whether of large or small capacity, are more economical than wooden cars. The discussion which followed the reading of the paper showed plainly that the railroads, at least in New England, are not yet convinced that, for their requirements, the high capacity car, whether made of steel or of wood, is more suitable than the wooden cars of comparatively small capacity which they are now using.

For certain kinds of freight the high-capacity steel car or composite wood and steel car is, without doubt, highly economical. But on such roads as those in New England where even the bulk freight is handled, as a rule, in small consignments to local points, it cannot be so readily conceded that cars of more than moderate capacity, say 60,000 lbs., are desirable. A steel underframe box car of 60,000 lbs. is no lighter than a wooden car; in fact, it is usually heavier. Wooden cars carrying even more than 30 tons have been built which are lighter than steel cars of equal capacity, notably a number of box cars of the Southern Pacific designed by Mr. F. E. Canda, which carry 100,000 lbs. and weigh only 33,000 lbs., as against 44,300 lbs. for the standard steel underframe box cars of the Pennsylvania. It is true that the usual design of wooden car will not carry without great risk the excessive overloads to which steel cars are often recklessly subjected; but where the average load of cars seldom exceeds 20 tons there is no need of building a car capable of carrying 40 or 45 tons and marking its capacity at 30 tons as is done with steel cars.

As regards the life of the wooden car, compared with steel, the whole argument is based largely on conjecture. None of the modern steel cars have been in use long enough to determine their ultimate length of useful service, and the author's estimate of 25 years is assumed from service records in Europe where the conditions are different. There is a mass of conflicting data about the loss of weight in steel due to corrosion, and until some definite conclusions can be drawn, based on a wide range of observation under every service condition, such data must be used with caution. Although there are a large number of cases in which wooden cars have been in continuous use for from 20 to 30 years, it is probable that such cars have been rebuilt from the sills up once or even many more times in that period, so that we are not disposed to question the assumption of the average life of such cars being about 15 years. But the high cost of repairs, from $35 to $80 per car per year, which has been taken as a basis of comparison, probably includes the cost of this rebuilding, which is usually done piecemeal. For steel cars, the cost of repairs is said to be from $9 to $15 per year; but most of the cars, on the repairs of which these figures are based, have only been in service from two to five years, and the oldest have not been running more than seven years. Any machine or structure which has a given number of years of useful life requires only light repairs during the first half of that period; later the repairs begin to increase rapidly. Our steel cars have not yet reached that point.

The strongest argument in favor of the general adoption of all-steel and steel underframe cars, and one which was barely touched upon either in the paper or in the discussion, is the fact that wooden-framed cars are always damaged when in collision with steel underframe cars, while the latter escape uninjured. If because of their decided economy, the high-capacity steel cars are continued in use, then it is essential that other cars which must be coupled up in the same trains with these "battle ships" should be made strong enough to withstand the severe shocks incident to the movement of the long trains of to-day. The

same argument of uniformity holds in this respect as in the case of couplers, or air-brake equipment. A light wooden car may be strong enough to carry the load for which it was designed, but it needs a stiff backbone in the underframe to protect it from being crushed between two heavy steel cars. The most efficient spring or friction draft gear will not prevent damage from this cause and thousands of old light cars are annually being destroyed in that way. It would seem that this is the primary cause for the need of metal frames for cars of light capacity, rather than a questionable economy in operating expense due to carrying larger loads and less dead weight.

Engineers of the New York Central are reconnoitering in Connecticut, and it appears that the company proposes to survey a route from a point on the Harlem division near Brewster, 52 miles from New York, across northwestern Connecticut to connect with the Boston & Albany not far west of Springfield. The fact, of course, suggests future competition for the passenger traffic between New York and Boston now monopolized by the New York, New Haven & Hartford; and there is also in the move a strong hint of a counter stroke to the recent acquisition of the New York, Ontario & Western by the New Haven company. Boston and southern New England journals manifest considerable interest in the survey; but probably, in essence, it is a mere gesture to warn off the New Haven company from using its new western purchase in a way seriously detrimental to the New York Central. While the foiled attempt of the Vanderbilts to buy control of the New York & New England several years ago will be recalled, there are more serious obstacles to the present proposition. It would involve (1) the construction of a very expensive line across the Berkshire hills; (2) the new line would have almost no local business, and at best would have steep grades; and unless it were an air line—the mere suggestion of which is grotesque—the distance through between Boston and New York would be considerably longer than by the longest of the three New Haven routes—232 miles by the Shore Line, 212 miles by the Air Line and 234 miles by way of Springfield; and (3) it would require consent of the Connecticut Railroad Commission on the layout and probably a special charter from the Connecticut Legislature, which never has been very inhospitable in such matters to the New Haven company's wealth and influence. There is another phase of the subject. There is a New Haven-New York Central contract that contains a clause—inserted, if we are not mistaken, at the time the New Haven built the Portchester road and established its Harlem River terminal—that pledges both parties not to compete from the New York terminals in the territory of the other, the whole contract terminable should the clause be violated. Under the contract the New Haven is now paying the New York Central for trackage and Grand Central Station terminal facilities about $1,100,000 a year, a sum not lightly to be surrendered. This contract, by the way, has its speculative suggestion on the question of the New Haven company's securing an independent entrance to New York through the subway. The subway is pushing population northward in such a way that nobody can tell where the center of the great city will be half a century hence.

October Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of October, printed in another column, contains accounts of 25 collisions, 16 derailments, and three other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

		Killed.	Injured.
2d.	Driscoll, N. D.	3	3
5th.	Mitchell, Ga.	1	5
10th.	Warrensburg, Mo.	30	60
10th.	New Iberia, La.	1	0
10th.	Saluda, N. C.	..	..
20th.	Yuba Pass, Cal.	..	..
21st.	Geneva, N. Y.	3	0
27th.	Lincoln, Neb.	2	0
30th.	Tipton, Mo.	3	10

The Warrensburg collision was reported in this paper October 14, but the cause is now more fully explained. The car in which the passengers were killed was next to the tender. Wrecks like this, and that at West Dunellen, N. J., a few years ago serve as reminders that in abolishing the old rule to have a baggage car ahead of the passenger cars in all trains a certain risk is being taken—unless the means of preventing collisions are bettered. One European government railroad administration has lately relaxed the legal regulations requiring that such a safety car be run in every passenger train—but probably those European despatchers and trainmen understand their business better than we do ours! The verdict of the coroner's jury at Warrensburg says that the trainmen responsible for the collision slept at their post of duty; but whether this was shown in the evidence or was only the jurymen's belief, is not clear. We never heard, however, of an engineman who started his train out of a side track while asleep, or of a conductor who give an all-right signal when not awake; so that this accusation—which has been repeated in the newspapers on similar occasions before—seems illogical. The essential fault of the men was not the sleeping, but the reckless action which they took when they were awake; and as recklessness of exactly the same kind has been found a good many times in cases where no one claimed that the culprits had been asleep, the present charge puts the emphasis in the wrong place.

In this collision and in that at Tipton in the same State, on the 30th, both on the same road, the passengers were going to or from the St. Louis exposition, so that the phrase so familiar in 1893, "caused by World's Fair travel," which the reporters have all summer been holding ready for use, at last came into play. But, as many other railroads also have had unusually heavy passenger traffic this year to and from St. Louis, and as the other most notable collisions of the summer have been between trains on lines not doing world's fair business, the burden of proof is on those who like to thus easily assign the blame to show what the world's fair has to do with the real cause. It is to be expected, of course, that in running 100,000 trains more collisions will occur than in running 50,000; but that is nothing but fatalism. The argument would forbid all efforts to increase traffic. The real question is, whether the methods or the men ought not to be improved; and on that the considerations pro and con are well understood.

The number of electric car accidents reported in the newspapers in October was 30, in which eight persons were killed and 189 were injured. One of the accidents was a rear collision of trains of empty cars on the Manhattan Elevated, New York City, in which the motorman was killed and the cars were damaged by a fire which appears to have been started by short-circuiting of the power current. No less than three of the accidents were runaways, in which the presence of leaves on the rails, impairing the efficiency of the brakes, was given as the immediate cause.

Some persons seem to think that railroad accidents have been harped upon too much of late. For the comfort of such—if they can get any comfort out of it—we copy from a Chicago paper the following report of the violent deaths occurring in that city in the month of October from all causes:

Forty-seven persons were killed by cars (railroad trains, 34; street cars, 13) in Chicago in October, according to the report of the coroner. The total number of accidental deaths was 107, so that the persons killed by cars constitute 44 per cent. of the whole number of accidents. The total number of deaths with which the coroner had to deal was 233. There were 43 suicides and 16 murders. In the accident list eight were run over by wagons, nine fell down stairs, six fell out of windows, ten fell in various other ways, two were electrocuted, one was killed in an explosion, eight were drowned, one was shot, one was bitten by a dog and later died of hydrophobia, one was accidentally poisoned, three died from burns, one was gored to death by a bull, one was kicked to death by a horse, six were asphyxiated by gas, and one fell down an elevator shaft.

Baltimore & Ohio.

The B. & O. reports a surplus for the year ending June 30, 1904, of $12,357,360. This amounts to 8.0 per cent. on the common stock after provision for the preferred. Last year the stated surplus was $13,818,163, or 9.2 per cent. on the common stock. There was charged to expenses $408,650 for betterments. Restoring this to income we find the common stock earned actually 8.3 per cent.

The system mileage compares as below:

	1904.	1903.	Inc.
Road, miles	4,442	4,397	45
2d, 3d and 4th tr'ks, miles	1,138	1,084	54
Sidings, miles	2,205	2,062	143
Total miles of track	7,785	7,543	242

Eighty-two passenger cars and 120 freight cars were added to the equipment; but on the other hand, 21 locomotives, 16 passenger and 2,004 freight and service cars have been condemned. This road a few years ago went heavily into new equipment. The past year as a road it has practically done nothing in the way of new equipment save the 7 per cent. of new coaches. The 109 new locomotives have been furnished by the Southwest Equipment Co. The equipment of the system, including affiliated lines, compares as follows for the two years:

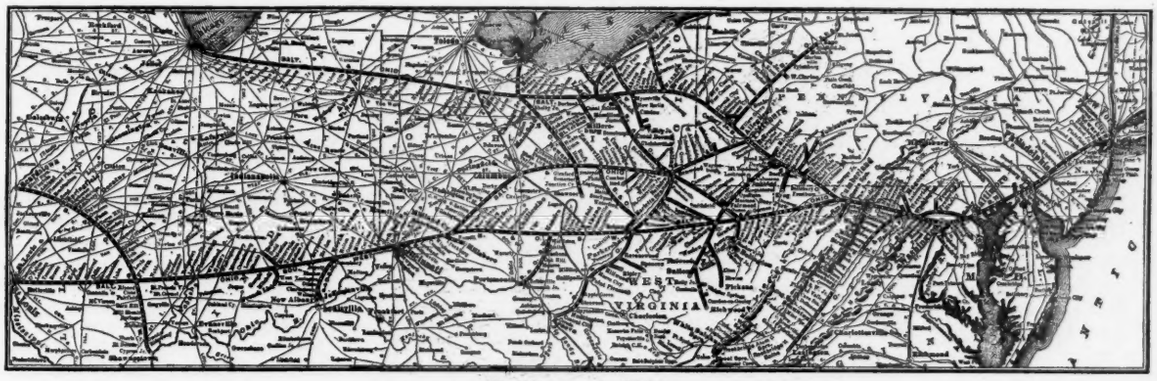
	1904.	1903.	Inc.-Dec.
Engines	1,848	1,769	79 I.
Passenger cars	1,214	1,158	56 I.
Freight cars	82,026	84,742	2,716 D.
Service cars	1,732	1,629	103 I.

The increases are on the affiliated lines and in the property of the Southwestern Equipment Company. There was spent on the Baltimore & Ohio and the affiliated lines for construction the grand total of $11,552,053. It was charged up as follows:

Capital account, B. & O.	$3,754,814
Capital acc't, other roads owned by B. & O.	470,257
Railroads, in general account	5,326,982
Surplus income of B. & O.	2,000,000
	$11,552,053

The work was of every kind so that it is difficult to characterize it in a general way. There was the building of a good deal of track, both main line and other tracks, and some spurs were pushed out to coal mines. At other points main line was relocated to eliminate curvature. Considerable expendit-

ures were made at the Mount Clare shops and in a small way at the various shops all over the system. But the B. & O. is known to be weak here and the expenditure in this direction this year does not in any way meet the situation. A good deal of money has gone into terminal improvements, especially at Cincinnati and at Washington. At the latter point the expenditures to date aggregate $2,731,624. They are borne jointly by the Baltimore & Ohio and the Philadelphia, Baltimore & Washington. Several years will be required for the completion of the work there, which is to include an imposing marble union passenger station in architectural keeping with the capitol and other



Baltimore & Ohio.

government buildings in that city. The balance sheet:

Assets.	
Cost of road	$291,645,959
Real estate	13,653,604
Gas and electric plants	667,723
Equipment	31,761,107
Cost of other roads owned by B. & O.	13,296,306
New stocks and bonds to retire old.	263,722
Miscellaneous assets	1,395,392
Due from other roads	8,130,796
S. W. Equip. Co. loan account for purchase of equipment	10,373,079
Cash	14,701,570
Cash assets	12,425,498
Securities of sundry companies	57,039,077
Material on hand	4,616,740
	$459,970,573
Liabilities.	
Capital stock: Preferred	$59,982,751
Common	124,262,060
Funded debt	227,262,530
Miscellaneous fixed debt	11,271,945
Miscellaneous liabilities	2,922,583
Two-year notes	10,000,000
Current liabilities	16,956,747
Profit and loss	7,311,957
	$459,970,573

The $10,000,000 of two year notes reflect the condition of the money market the past year when railroads found it impracticable to sell bonds for new capital.

The financial transactions for the year are shown by the next table:

Debit:	
Liabilities increased—	
Preferred stock	$608,462
Funded debt	5,281,041
Miscellaneous liabilities	9,322,303
Profit and loss	1,805,308
Assets decreased—	
Equipment	481,113
Current assets	1,264,255
	$18,762,482
Credit:	
Assets increased—	
Cost of road	$4,808,937
Real estate	734,819
Cost of other roads	1,457,632
Miscellaneous assets	*7,178,728
Securities other companies	3,314,131
Liabilities decreased—	
Current liabilities	1,268,235
	$18,762,482

*In the balance sheet above miscellaneous assets have been separated into "miscellaneous assets" and the two items following.

The company raised nearly $6,000,000 from stock and funded debt and about $10,000,000 on notes. It has also drawn down assets about $2,000,000. Of the proceeds, $5,542,000 have gone into the road, $1,500,000 into other roads which the company owns, $3,000,000 into the securities of other companies, and $7,000,000 to advances to auxiliary companies for their new construction work. Its financial position is practically unchanged except for the $10,000,000 note issue. The income account is:

	1904.	1903.	Inc. or Dec.
Earnings	$65,071,080	$63,449,633	$1,621,447 I.
Expenses	43,628,863	39,569,963	4,058,900 I.
Net	$21,442,217	$23,879,669	$2,437,452 D.
Other income.	2,648,597	1,609,850	1,038,747 I.
All income.	$24,090,814	$25,489,519	$1,398,705 D.
Deductions	11,733,454	11,671,356	62,097 I.
Net inc.	$12,357,360	$13,818,163	$1,460,803 D.
Betterments	2,000,000	3,500,000	1,500,000 D.
Balance	$10,357,360	$10,318,163	$39,197 I.

The whole story is here told in an increase in expenses which is $2,437,452 greater than the increase in earnings. Other income showed a handsome gain of over $1,000,000. The remaining difference was used up in a reduction of the betterment appropriation by $1,500,000. Earnings increased but 2 per cent. Passenger and freight earnings are:

	1904.	1903.	Increase.
Passenger	$13,146,448	$12,520,987	$625,460
Freight	48,617,103	47,756,251	860,852

The freight business was much disturbed during the year. The tie up of lake traffic at the beginning of the season was a large factor. The hesitation in the iron and affiliated industries cut off much. The increased freight receipts were entirely due either to better rates or a better class of freight, the average receipt per ton mile having been 5.82 mills this year compared with 5.56 last year. The actual freight movement fell off nearly 3 per cent. The decline was in coke, ores and iron products and grain. Bituminous coal ton mileage showed a gain of 10 per cent. and an increase of 4 per cent. in the average ton mile revenue. The averafe haul of bituminous coal is 197 miles. Expenses were:

	1904.	1903.	Inc. or Dec.
Maint. of way	$7,687,840	$6,175,115	$612,724
Maint. of equip.	10,374,591	8,270,156	2,104,434
Cond. transp.	24,761,628	23,653,780	1,107,847
Gen'l expenses	1,704,803	1,470,911	233,892
Total	$43,628,863	$39,569,963	$4,058,900

There was no stinting of maintenance; all maintenance increased 18 per cent. In maintenance of equipment alone the increase was nearly 25 per cent. On roadway and structures there was spent $1,703 per mile; 38,200 tons of new rails were put in track and 1,411,094 ties. The maintenance of equipment was: Per locomotive, $2,624; per passenger train car, $604; per freight car, $55.

There is an increase of $1,107,847 in transportation expense with an actual decrease in ton mileage. In the detail table we find an increase of half a million in the fuel bill, $100,000, or 18 per cent., in superintendence, and $271,244 in damage expenses. This last expense has this year reached $1,238,000. But there is one very handsome decrease, namely, $367,000 in car mileage balance. As the equipment was practically the same as last year this would seem to indicate excellent work in utilizing home cars and in sending foreign cars promptly back to their owners.

The train load has declined from 416.43 to 401.25 tons. This is explained probably by the falling off in ore and iron products. The irregularity of the traffic has produced another expensive condition in an increase of 6 per cent. in the empty car mileage.

The programme of renovation which began on such a sweeping scale under the receivers is still apparently in full force. When Mr. Underwood was on the Baltimore & Ohio the needs for many years to come were canvassed most thoroughly and it is along the lines then laid out that most of the work has since proceeded.

Chicago, Burlington & Quincy.

The Burlington earned $12,814,916 in 1904 compared with $13,326,108 in 1903. The earnings amounted to 11.65 per cent. on the stock. If the amount appropriated for sinking fund is restored the actual earnings upon stock will be 12.30 per cent. Of the surplus for the year 65 per cent. was distributed in dividends. The company added 55 miles to its line by taking over the Iowa & St. Louis Railway, by completion of the new line from Oskaloosa to Tracey, Iowa, and by the completion of the line from Old Monroe to Mexico, Mo. The latter connects with the Chicago & Alton and forms a through line between St. Louis and Kansas City.

The company has added 50 new locomotives, 85 passenger train cars and 2,000 coal cars to its equipment.

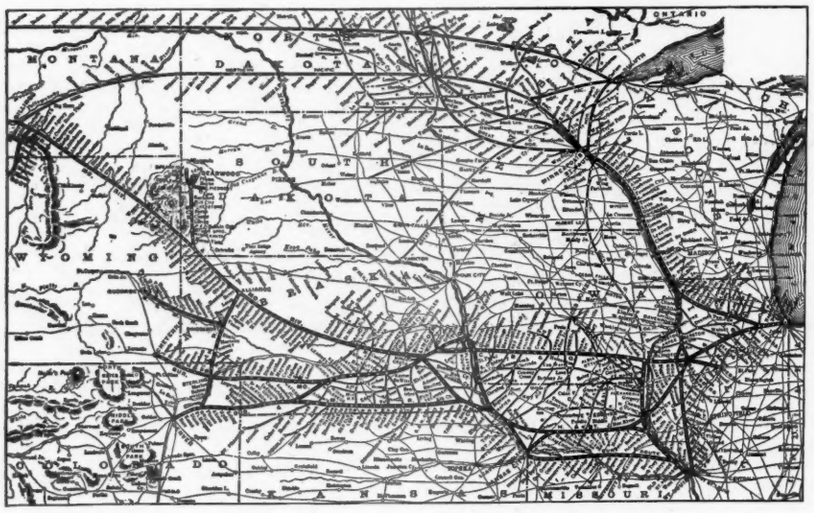
During the year about $13,000,000 was spent on the property. Of this $4,200,000 went for equipment, about $2,800,000 for new lines whose construction was completed this year, over $1,600,000 for grade deductions, about $1,000,000 for passing and side tracks, and nearly $1,000,000 for bridges and ballast. Sundry smaller items with $1,220,000 discount and premium on bonds sold and bought swell the total to $13,046,000. All the cost of new work and new equipment was charged to capital account. No part of it was provided out of earnings.

The financing during the year was as follows:

Debit:	
Liabilities increased—	
Funded debt	$14,964,200
Special funds	2,566,347
Profit and loss	5,275,347
Sinking fund	1,408,674
Assets decreased—	
Controlled roads	5,780,650
	$29,994,938
Credit:	
Assets increased—	
Cost of road	$19,318,858
Sundry investments	1,303,489
Sinking fund investments	883,306
Materials and supplies	934,024

Sundry securities	74,600
Cash	1,742,629
Liabilities decreased—	
Coupon interest reserve	56,576
Current assets and liabilities	5,954.456
	$29,994,938

The sum of it all is that the company has completed some extensive construction work and taken over some new lines. To do this it transferred several millions from the item "controlled roads" to "cost of road." It drew upon its special funds and current assets for part of its needs, but principally drew its money from the proceeds of a fifteen million dollar increase in the funded debt. Altogether "cost of road" has been increased $19,318,000. A considerable part of the proceeds of the bonds sold went to reduce current liabilities and to increase cash. In its immediate finances the company has much improved its position, having now nearly $2,000,000 more cash and about $6,000,000 less of current liabilities. The income account below shows a decline of nearly half a million in surplus, or about 4 per cent.



Chicago, Burlington & Quincy.

Income Account.

Earnings from:	1904.	1903.	Inc. or Dec.
Freight	$44,651,996	$42,782,405	$1,869,591 I.
Passgr., mail & express	18,086,395	17,417,104	669,291 I.
Misc'nous	2,489,800	2,438,869	50,931 I.
Total	$65,228,091	$62,638,378	$2,589,713 I.
Expenses:			
Cond. trans.	$20,266,481	$17,985,963	$2,280,518 I.
M. of E.	8,376,602	7,719,044	657,558 I.
M. of W.	10,277,274	9,341,728	935,546 I.
Gen'l expns.	3,751,936	3,717,261	34,675 I.
Total	$42,672,293	$38,763,996	$3,908,297 I.
Net	$22,555,898	$23,874,382	$1,317,484 D.
Taxes	1,906,649	1,778,476	128,173 I.
Net earn'gs	$20,649,249	$22,095,906	$1,446,657 D.
Net inc. on securities	204,116†	346,540	550,656 D.
All income	$20,445,133	$22,442,446	$1,997,313 D.
Charges	7,630,217	9,116,338	1,486,121 D.
Net income	$12,814,916	$13,326,108	$511,192 D.
Dividends	8,834,749	8,834,570	179 I.
Balance	$3,980,167	$4,491,538	$511,371 D.

†Deficit.

The loss of half a million in surplus is the result of three factors, first, a decrease in net earnings; second, a decrease in charges, which is just about large enough to offset the decrease in net earnings; third, a decrease in the profits on investments of about $550,000.

Gross earnings increased about $2,600,000, or 4 per cent., most of it being in freight. The average receipt per ton mile decreased from 8.7 mills to 8.6, so that the increase in freight earnings is due entirely to an increase in the business handled. In the passenger business there was a slight increase in the average rate. The passenger mileage increased less than 1 per cent.

The conspicuous feature of the income account is the enormous increase in transportation expenses. Gross earnings increased but 4 per cent., while transportation expense increased almost 13 per cent., or about three times as fast. In fact, the increase in transportation and general expense absorbed nearly 90 per cent. of the increase in gross earnings. The report is very meagre in the information that bears vitally on operation. Hence we can form no opinion as to how this heavy increase occurred. In the train load, both passenger and freight, the company made substantial improvement:

	1904.	1903.	Inc.
Pssgr train-mile revenue	$1.36	$1.26	$0.10
Freight train-mile revenue	2.38	2.31	.07
Tons per freight train	2.78	2.66	.12
Tons per loaded freight car	15.53	14.78	.75

This improvement in the freight train load is the more to be commended because it was in face of a bad balance of traffic. The empty car mileage increased nearly 10 per cent. Expenditures for maintenance of way appear to have been liberal, being $1,168. On the equipment the outlay was yet more liberal—$2,500 per locomotive, $75 per freight car, and $800 per passenger train car. The entire maintenance outlay was 10 per cent. greater than last year.

Burlington has had a fair year of growth. The stable character of its prosperity is amply evident, as also the conservatism in its operation. It is financially in a strong position. The extraordinary transportation expense must have some explanation in extraordinary conditions in the past year; no other explanation is consistent with the reputation of the men in charge of the company's affairs. We do know, however, that the winter in the northwest was one of unprecedented severity.

NEW PUBLICATIONS.

Elements of Mechanical Drawing. By A. P. Jamison, Assistant Professor of Mechanical Drawing, Purdue University. New York: John Wiley & Sons, 1904. Cloth, 226 pages. Price $2.50.

Mechanical drawing is a subject not to be learned entirely from books, but a good book is a great aid to the student in teaching him some of the fundamental principles of drawing. In many ways there is as much skill and manual dexterity required in making mechanical drawings as there is in making free-hand drawings, although possibly the imagination cannot be given such free play. The average college course in mechanical drawing teaches the student only the rudiments, and in so far as it is possible to put into book form the many suggestions and criticisms which are the chief benefit in a course where the student comes in personal contact with the instructor, these suggestions and criticisms have been embodied in this latest book on mechanical drawing. The author has had a number of years' experience as an instructor in a large technical college, and has drawn copiously upon his lecture notes to compile a book which is at once a text book and a reference book. About 140 illustrations are included in the text and they are all uniformly excellent.

Methods and Costs of Rock Excavation. By H. P. Gillette. New York: M. C. Clark. Price $3.

The author has endeavored in this book to gather together sufficient data to enable an inexperienced engineer to predict the cost of rock excavation with tolerable accuracy and also to point out how and where savings can be effected in the ordinary methods for this class of work. The book includes within its scope not only quarrying and open cut excavation, but trenching, sub-aqueous excavation and tunneling as well. Many practical hints and actual examples taken from practice of the cost of rock work are given. One chapter deals in particular with the cost of railroad tunnels. As a reference book for those who have occasion to estimate and carry out rock excavation of almost any kind this book should be particularly valuable.

Per Diem Rates for Car Service.—The articles by Mr. Arthur Hale, Chairman of the Car Service Committee of the American Railway Association, on the working of the per diem car service rules during the past two years, which were published in the *Railroad Gazette* of October 14 and 21, have been reprinted in pamphlet form, and copies may be had at the office of the *Railroad Gazette* at 25 cents each. On orders for the pamphlets in quantities a discount will be made.

TRADE CATALOGUES.

Something Pneumatic for October contains illustrated articles on "Pneumatic Tools for Eastern Countries," reprinted from the *Indian and Eastern Engineer* for April; "Mechanical Appliances in Modern Shipbuilding," by Waldon Fawcett; "Construction of the Minnesota," the new steamer of the Great Northern R. R. There is also a note of thanks from the Vice-President of the Fifth National Industrial Exhibition of Japan to the Chicago Pneumatic Tool Company, for its exhibit at this exhibition, the original being reproduced, with a translation below.

Henry R. Worthington, 114 Liberty street, New York, issues Bulletin No. 114, describing "underwriter" fire pumps designed to meet the specifications of the insurance companies. These pumps have air and vacuum chambers, relief valves, pressure gages and other special devices differing considerably from ordinary trade pumps. The back cover of the pamphlet shows the 14 Worthington fire pumps supplied to the Louisiana Purchase Exposition for the protection of the buildings at the fair.

The A. S. Cameron Steam Pump Works, New York, sends a miniature reproduction

of part of its complete catalogue. It contains a few of the many designs of pumps made by this company. A number of illustrations of pumps and their detaills are given as well as a detailed description of the Cameron steam end and water valve chest. It also contains a brief article on Simplex vs. Duplex pumps, and directions for ordering, setting up and running pumps are given.

The Chicago Pneumatic Tool Company, Chicago, has issued a new catalogue. It is 6 in. x 9 in. and contains 126 pages. The cover designs are original and appropriate, being engraved from well-executed sepia drawings. The book is printed on enameled paper and is well designed and arranged. It covers completely the large and varied line of products of the company, and is fully illustrated.

The George F. Blake Manufacturing Company, New York, has published a new edition of its General Catalogue, the 150 pages of which describe and illustrate steam pumps for every possible service, including boiler feeders, mining pumps, water-works pumping engines, vacuum pumps, air pumps and condensers, etc. This company has recently established a new machine shop and foundry.

Greenlee Brothers, Chicago, and Rockford, Ill., is distributing its catalogue. It consists of a number of nicely bound circulars 9 in. x 12 in., which illustrate and describe in detail railroad car shop and other special wood working machines, mortising chisels, machine boring bits, augers, etc.

The Laidlaw-Dunn-Gordon Company, New York, is distributing its bulletin L-602. It describes a special steam-head for operating deep well pumps, which is designed for pumping from all classes of wells where it is necessary to place the pump cylinder far below the steam cylinder.

The Chicago Tool & Supply Company, Chicago, issues a four-page circular relative to Green pneumatic hammers, Dunlap piston air drills, pneumatic motor hoists, reversible back-geared pneumatic motors, rivet heating forges, air compressor and other specialties which it handles.

CONTRIBUTIONS

The Manibill.

Boston, Mass., Nov. 11, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Being much interested in an improved method of manifesting devised by Mr. Felch, I must object to the summary manner in which you dismiss that method in the last paragraph of your otherwise interesting article upon the manibill in your issue of Nov. 4th.

The whole trend of modern accounting is towards the indvidual original record, made in such manner and in sufficient quantity to be arranged and assembled to obtain any desired result; and the railroads will have to come into line as the demand for detail statistics becomes ever more insistent.

The manibill being a step in this direction is worthy of serious attention, but it does not go far enough. When a shipper makes a forwarding order, he makes the original record, which only needs the addition of rate, charges, route, car number, to make it the ideal waybill; ideal, because it prevents all errors in the directory and descriptive parts of the bill due to transcribing, such as billing to wrong name, wrong station, omission of, or misnaming articles, omission of address, omission of expense, or billing prepaids as collect and vice versa. And it is just as practicable to make all the necessary papers at the time the receipt is made as it is to transcribe from that receipt to produce the same result as is done under the manibill system.

Under Mr. Felch's method the following are some of the advantages. The blanks are simple and easily filled out, and being of a convenient size, would be often made by the typewriter; the fact that the consignee gets the identical work of the shipping house, tends to improve the latter's work in legibility and correctness, while all corrections necessary to make order correspond with shipment, showing upon all the papers, fixes the same so that all can understand. The provision for station stamp furnishes the shipper with definite information as to just who handled his consigment and makes tracing and further inquiries easy. No delay on account of the necessity of copying in billing, as the waybill is ready to go, before it would be possible to seal the car and get it into the train. All bills, and accompanying papers can be placed in a pocket with mica front, folded so as to show all route directions. All bills, delivery checks, arrival notices and check out slips, being in the writing of the consignor permits of an accuracy in delivery that cannot be obtained from a recopy of the original. The directory and descriptive parts of the papers being the work of the shipper, the consignee can take up any discrepancies direct instead of working through the railroads as is now necessary, thus saving a mass of correspondence, claims and misunderstandings. Shippers are benefited by a more expeditious and correct handling of shipments; by the customer getting an identical copy of the shipping advice, with all marks and numbers to aid in fixing the particular shipment; both consignor and consignee benefited by relief from errors of incompetent, or careless, bill clerks. The railroad is benefited in it not being possible to make an error in the directory and descriptive parts of the billing; in that it will save all the time and cost of recopying the billing instructions of the shippers.

F. LINCOLN HUTCHINS.

Steel Cars.*

Metal cars in the Unted States, while comparatively of a late origin, the first of any quantity being built in 1897, are yet older than is generally known. To-day we are sometimes surprised to find in an out-of-the-way corner a car of some queer design that probably made a great stir in its own small world when it was new, but which has long since been forgotten and abandoned, except by those who are unfortunate enough to have to keep it in repair. These types of cars are often pointed to as an example of the ultimate end of the modern product. A short time ago I came across some all-metal box cars in a railroad yard that had been in service about 25 years and are now doing duty as ash cars. These cars bear about as much resemblance to the modern steel car as an old wood burner does to our latest type of locomotive, and were, no doubt, of a weak design, even for the time in which they were built. Using them, therefore, as an argument against our modern designs would be manifestly unfair.

The question of corrosion has been much discussed and there are those who are extreme enough in their views to claim that a car of steel construction would, in the course of time, by the action of weather, etc., entirely disintegrate. It is safe to assume that one portion of a car will fail before the remainder; what that portion is will be due to the individual service of the car in question and to the ability and forethought of the designer. I have only to say that the first cars built by us in 1897 have been running in the coal and ore trade continuously, and do not show evidence of deterioration from any cause. We have records of cars in service on the Eastern Railway of France built in 1869, showing in 28 years of service a loss of only 6 per cent. by corrosion.

The claim that the chemical action of coal from a "wet" mine will eat through a plate in a short time has not as yet been clearly proved by actual results. Take, for example, a locomotive tender; it represents a condition that a car would never meet, yet it has never been suggested to substitute a wooden lining in the coal hoppers. Suppose that a car has been left on a side track for a few years, loaded with soft coal and exposed to all inclement weather. This, of course, is practically an impossible condition in these days of the *per diem* system; but, supposing that this happened and that this car had got in such condition as to need repair. The parts affected could be repaired or cut out and replaced just as easily and as cheaply as similar parts could be replaced on a wooden car. It is much easier to cut out soft-steel rivets with a cutter and a maul than it is to saw through a soggy piece of timber with nails in it.

One of the large railroads operating between 20,000 or 30,000 steel cars, determined, by actual experiment, that the steel plates used in its cars lost about $^1/_{200}$ of an inch in four years by corrosion. This company is not repainting any more of its steel equipment. From an artistic point of view this is not a success, as a train of unpainted cars after several years' use would present a color scheme something akin to a battered tin dinner pail; but when the results show on the right side of the balance sheet, the appearance of equipment is not usually considered.

In New England the tendency has been, with a few exceptions, to adhere to an all-wood construction. The principal reason for this is not prejudice, but a conviction, that steel construction is desirable only when used in connection with a high-capacity car. The service on a majority of the roads in this section does not usually demand a box car of over 60,000 lbs. capacity, and steel construction has been considered unnecessary. The cost of a 60,000 lbs. capacity wooden car, not including a flat car or a car designed for special purposes, is from $18 to $30 per ton of carrying capacity. This price, of course, is governed by the following conditions: The type—a box car costing more than a gondola; the specialties used, including trucks; the ideas and ability of the man designing the car. A 60,000 lbs. capacity box car with the same specialties and trucks and with steel underframe will cost from $2 to $4 more per ton carrying capacity, or from $60 to $125 per car. It will be shown later by comparative figures, based upon the net earnings throughout their assumed life, that this increase in first cost is advisable.

The reasons for building small-capacity box cars should not apply in this section to gondolas and flats. The lading in cars of this type is of such a character that a higher capacity car made of steel could be used to great advantage.

One point in favor of steel construction in a box car is that the underframe being rigid, the posts and braces are called upon to resist only the shocks from horizontal strains

*Extracts from a paper by J. F. MacEnulty, Pressed Steel Car Company, read at the October meeting of the New England Railroad Club.

of the load. A wooden underframe is continually settling, and the superstructure is thus brought in to assist the sills in supporting the vertical load. This results in bulging sides and ends and leaky roofs. By the use of a rigid steel underframe there is also a saving on the flange wear of the wheels. The timber used in wooden car construction is not thoroughly seasoned. It may be bought as seasoned timber, but it is very seldom that it is up to the specification desired. As a result from natural shrinkage, a wooden underframe will in the course of time ride flat on the truck side bearings. This causes an increase in friction on the wheel flanges with corresponding results. A properly constructed steel frame will hold up under any conditions and allow free movement of cars of the same capacity, but it can be readily seen that there would be a marked difference. The constant increase in motive power units and the heavier tonnage being hauled per train is fast bringing about a condition that will necessitate the introduction of steel in the underframe of every new car built. Cars are constantly being hauled in trains of 2,000 tons or over, and they are subjected to severe buffing strains from the shocks of heavy high-capacity cars shifted against them in the classification yards. To construct a wooden frame to successfully meet these conditions and withstand the increasing rough usage would necessitate an outlay of first cost that would be useless, when the comparatively small increase of outlay necessary for a steel car is considered.

a fair average for a car in continual service. The average life of a steel car is assumed at 25 years. None of the modern cars are old enough as yet to accurately determine their life. In those cars first built there are no signs of wear that accurate figures can be based upon. Basing an estimate on cars in service abroad, however, 25 years is a conservative figure. At the end of the 15-year life of the wooden car the cost, earning power, depreciation, etc., of a second wooden car must be introduced in order to equalize the time represented by the longer life of the steel underframe car—the cost of the second car being taken from the sum earned by the first car at the end of 15 years, and the balance of the money being carried forward with a credit of compound interest

Comparative Earning Value of Steel and Wood Under-Framed 80,000-Lb. Capacity Box Cars.

Framing.	Purchase price.		Earnings at the end of— 5 years.	10 years.	15 years.	20 years.	25 years.
Steel underframe.	$730	Earnings at $990.00 per annum for 1st 5 years plus 5 per cent. interest	$5,470.35				
		" " 961.00 " " " 2d 5 " " 5 " " "	.....	$12,291.81			
		" " 954.00 " " " 3d 5 " " 5 " " "	.....	.....	$20,959.25		
		" " 948.00 " " " 4th 5 " " 5 " " "	.....	.....	.....	$31,988.18	
		" " 940.00 " " " 5th 5 " " 5 " " "	.....	.....	.....	.....	$46,019.98
		Less:—Depreciation of value of car at 4 per cent. per annum	129.71	235.46	321.69	392.00	421.50
		Interest on purchase price of car at 5 per cent. per annum	201.67	459.06	787.55	1,206.90	1,540.32
		Cost of repairs and renewals at $15.00 per annum for 1st 5 years	75.00				
		" " " " " 18.00 " " 2d 5 "	.....	165.00			
		" " " " " 21.60 " " 3d 5 "	.....	.....	273.00		
		" " " " " 25.92 " " 4th 5 "	.....	.....	.....	402.60	
		" " " " " 31.10 " " 5th 5 "	.....	.....	.....	.....	557.50
		Interest on cost of repairs and renewals at 5 per cent. per annum	4.12	6.11	8.79	12.41	17.27
		Total	$410.50	$865.63	$1,391.03	$2,013.91	$2,536.59
		Credit by scrap value of car	189.00	189.00	189.00	189.00	189.00
		Net charge against car	221.50	676.63	1,202.03	1,824.91	2,347.59
		Net earnings	5,248.85	11,615.18	19,755.22	30,163.27	43,672.39
		Earnings per $1.00 of purchase cost of car	7.19	15.91	27.00	41.31	59.82
		Percentage of earnings per $1.00 invested in purchase cost of car as compared with wood-framed cars ..... INCREASE	.....	.....	8 1/10%	.....	118 3/10%
Wood underframe 1st car.....	$660	Earnings $960.00 per annum for 1st 5 years, plus 5 per cent. interest	$5,304.60				
		Earnings 864.00 per annum for 2d 5 years, plus 5 per cent. interest	.....	$11,441.38			
		Earnings 826.00 per annum for 3d 5 years, plus 5 per cent. interest	.....	.....	$18,340.35		
		Less:—Depreciation of value of car at 6 per cent. per annum	168.31	291.83	382.48		
		Interest on purchase price of car at 5 per cent. per annum	182.34	415.07	712.09		
		Cost of repairs and renewals at $35.00 per annum for 1st 5 years	175.00				
		" " " " " 57.50 " " 2d "	.....	462.50			
		" " " " " 80.00 " " 3d	.....	.....	862.50		
		Interest on cost of repairs and renewals at 5 per cent. per annum	9.66	18.55	29.89		
		Total	$535.31	$1,187.95	$1,986.96		
		Credit by scrap value of car	158.48	158.48	158.48		
		Net charge against car	$376.83	$929.47	$1,828.48		
		Net earnings	4,927.77	10,511.91	16,511.87		
		Earnings per $1.00 of purchase cost of car	7.46	15.92	25.01		
		Percentage of earnings per $1.00 invested in purchase cost of car as compared with steel underframe ..... DECREASE	.....	.....	7 4/10%		
Wood underframe 2d car.....	$660	Earnings 1st car at end of 15 years less cost of 2d car at 5 per cent. interest	.....	.....	$15,851.87	$20,231.45	$25,821.30
		Earnings at $960.00 per annum for 1st 5 years, plus 5 per cent. interest	.....	.....	.....	5,304.60	.....
		Earnings at 864.00 per annum for 2d 5 years, plus 5 per cent. interest	.....	.....	.....	.....	11,441.38
		Total	.....	.....	.....	$25,536.05	$37,262.68
		Less:—Depreciation of value of car at 6 per cent. per annum	.....	.....	.....	168.31	291.83
		Interest on purchase price of car at 5 per cent. per annum	.....	.....	.....	182.34	415.07
		Cost of repairs and renewals at $35.00 per annum for 1st 5 years	.....	.....	.....	175.00	.....
		" " " " " 57.50 " " 2d "	.....	.....	.....	.....	462.50
		Interest on cost of repairs and renewals at 5 per cent. per annum	.....	.....	.....	9.66	18.55
		Total	.....	.....	.....	$535.31	$1,187.95
		Credit by scrap value of car	.....	.....	.....	158.48	158.48
		Net charge against 2d car	.....	.....	.....	376.83	1,029.47
		Net earnings of 2d car, plus earnings of cash from 1st car	.....	.....	.....	25,159.22	36,233.21
		Earnings per $1.00 of purchase cost of both cars	.....	.....	.....	19.04	27.37
		Percentage of earnings per $1 invested in purchase cost of 2 wooden underframe cars as compared with 1 steel underframe car ..... DECREASE	.....	.....	.....	.....	54 2/10%

trucks. The influence of this condition is shown also in drawbar pull of locomotives. It has been determined by two of the large railroad systems that the drawbar pull required to move a ton of freight in a properly constructed car of 100,000 lbs. capacity is 24 per cent. less than is required to move the same amount in an average wooden car of 60,000 lbs. capacity. The locomotive expense affected by this is about 15 cents per mile.

With a yearly mileage of 480 train or locomotive miles at 15 cents per mile the total cost per year would be $72. If the same load is moved in a steel car this saving of 24 per cent. would amount to $17.28 per year. This percentage would, of course, not be so great, comparing steel and wood

Reports from different railroads place the average cost of repairs to wooden cars at from $35 to $80 per car per year—this last figure being from a system that uses more than 100,000 wooden cars over a large territory. The average cost of repairs to steel cars and cars of steel underframe ranges from $9 to $15, and that, too, on cars which have been in service six or seven years.

The comparative cost of maintenance of steel and wooden cars has been carefully worked out by Mr. C. A. Lindstrom. The accompanying table is based upon actual results obtained from roads using steel and wooden cars. The life of a wooden car has been put at 15 years. There are, of course, instances where wooden cars have been in service for a longer time, but this figure is

at the rate of 5 per cent. per annum. While these figures are based upon an 80,000-lbs. capacity car, the proportionate results for other capacities are similar.

It has been calculated (International Railway Congress, Bulletin No. 5) that to haul the additional weight of an 80,000-lbs. car costs $23.10 per year. This can be paid for by hauling seven tons 857 miles. The increase in cost for hauling a 100,000-lb. car at the same proportion can be paid for by hauling seven tons 1,000 miles. A steel underframe for an 80,000-lb. car adds to first cost, approximately from $70 to $150, and for a car of 100,000 lbs. capacity about $175. It can, therefore, be assumed that as this is practically the only additional cost, the saving in repairs would pay for the increase

in first cost in a short time, giving a desirable interest on the first investment. To this, of course, can be added the additional earning power due to loads exceeding the capacity of a 60,000-lb. car. It has been recognized by some of the larger roads of the country that they will get loads of over 60,000 lbs. in a box car often enough to pay, at this rate, for the hauling of the additional weight and realize a comfortable profit be-

carry timbers cut to size for immediate use.

The saving resulting from the use of steel equipment can be stated roughly, as follows:

Reduced number of cars required for any given train load with a resultant loss of friction and atmospheric resistance.

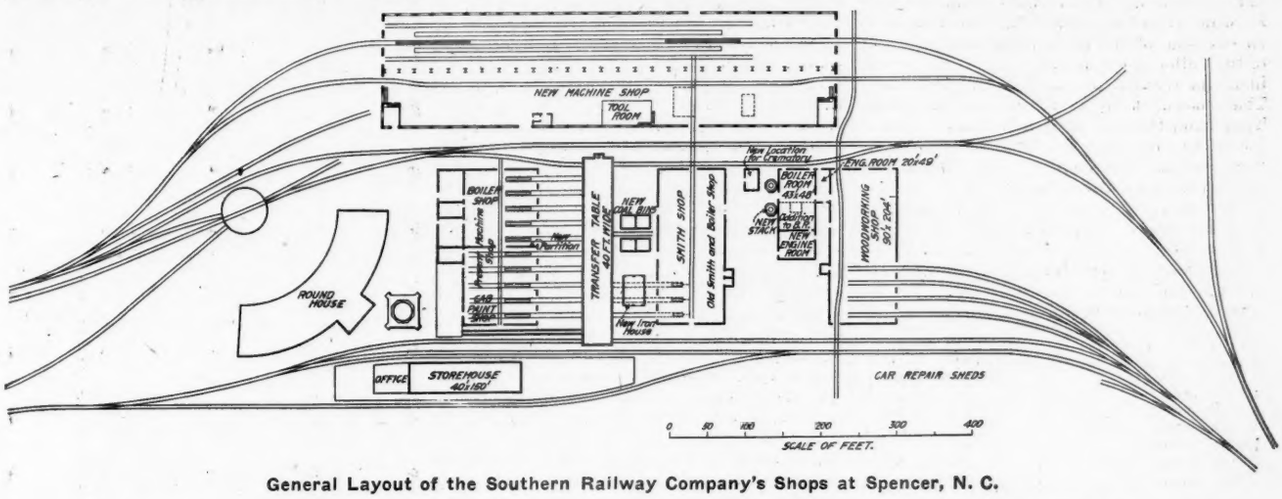
Decreased liability of wreckage and security from loss by total destruction.

Increased tonnage pulled by locomotive.

Increase in mileage due to less time on

Improvements at the Spencer Shops of the Southern Railway.

The Southern Railway Company has just completed the enlargement of its locomotive repair shops at Spencer, N. C. The work consists essentially of a new locomotive erecting and machine shop together with additions and rearrangements of some of the old buildings. S. Higgins, former Me-



General Layout of the Southern Railway Company's Shops at Spencer, N. C.

sides. This condition would probably be made manifest in New England by actual trial.

When a man who has been used to repairing wooden cars is called upon to patch up steel cars his first wish is that he had spent some years of his apprenticeship in a boiler shop. This is particularly the case on roads which have no steel cars and have made no provision for repairs to that class of cars. A comparatively small outlay will prepare a road, however, for any repairs that are needed. An expenditure of about $1,000 will furnish portable forges, oil burners with air-blast attachments, pneumatic hammers, mauls, formers, drift pins, etc., to keep in repair any reasonable number of steel cars. As for the education of the men for this class of work, a very few days is sufficient to make experts of repair men of average in-

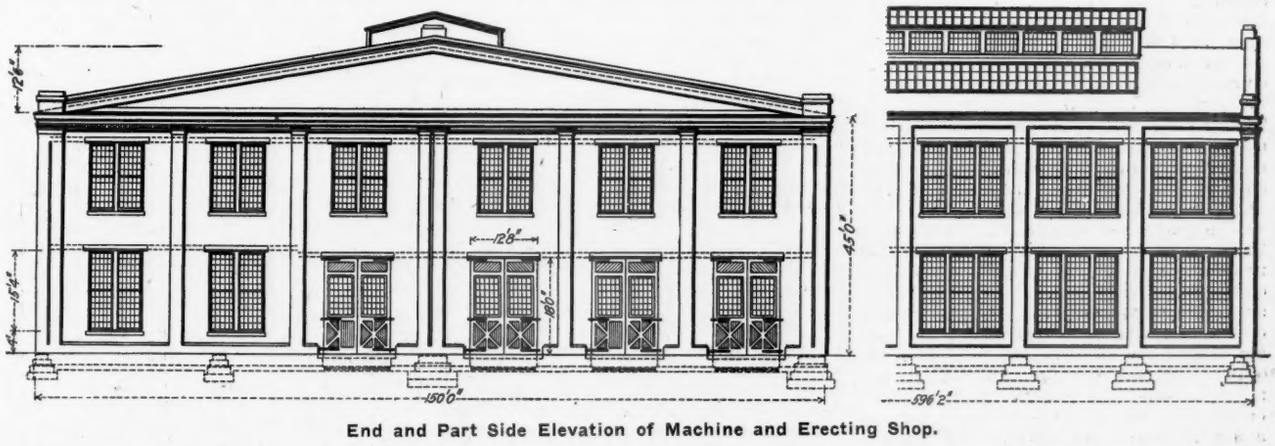
repair track with consequent decrease in cost of inspection.

By way of comparison the following table which was compiled in 1900 is given. In that year there were in actual service in the United States on different railroad systems about 1,500,000 wooden cars, with an average weight of over 14 tons each, making the total weight of all wooden cars in service about 21,000,000 tons.

Average capacity of wooden cars, tons	25
Total capacity of all cars, tons	37,500,000
Average yearly mileage of loaded car	3,500
Average yearly mileage of empty car	3,500
Assumed average gross earnings per ton-mile, mills	8
Assumed average cost of moving 1 ton 1 mile, mills	3
Yearly income from assumed gross earnings	$1,050,000,000,000
Yearly cost of hauling load	394,000,000,000
Yearly cost, houling dead weight	441,000,000,000
Total yearly profit	$215,000,000,000

If the above-mentioned lading of 37,500,000

chanical Superintendent, was the first to suggest making improvements and to present the subject in a tangible form to the management. He submitted a number of plans, including both longitudinal and transverse layout. Mr. Higgins recommended the longitudinal layout which was finally adopted as submitted by him with but few modifications. S. D. Cushing, Signal and Electrical Engineer, assisted Mr. Higgins in preparing the plans and estimates, and was put in charge of all of the detail work. The buildings were designed in the office of D. W. Lum, Chief Engineer Maintenance of Way and Structures. After the plans were completed and the orders for the tools had been placed, Mr. Higgins resigned to become General Manager of the N. Y., N. H. & H. Railroad. The plans were turned over to his successor, A. Stewart, who carried them



End and Part Side Elevation of Machine and Erecting Shop.

telligence who have formerly worked only on wooden cars.

The majority of roads having steel equipment have educated their repair men to both classes of cars, and the work is now done as easily as though there was but one class of equipment. It is, of course, advisable for a road having in service a number of steel cars to carry in stock such repair parts as would likely be needed, just as they now

tons, representing the entire freight-carrying capacity of cars in the United States, was concentrated in large capacity, light-weight steel cars, the dead weight would be cut down from 21,000,000 tons to 14,000,000 tons, and the resulting saving in cost of transportation would be $147,000,000. This, of course, is a purely speculative calculation but under any local conditions the proportion holds and there is the same ratio of economy.

through as originally designed. The work was done under the supervision of S. R. Richards, Master Mechanic of the shops. The general design of the shops varies from that of other shops of recent design in that the old buildings were used. No addition has been made to the freight car repair department, as this department now has ample facilities for making both light and heavy repairs. All the improvements are for in-

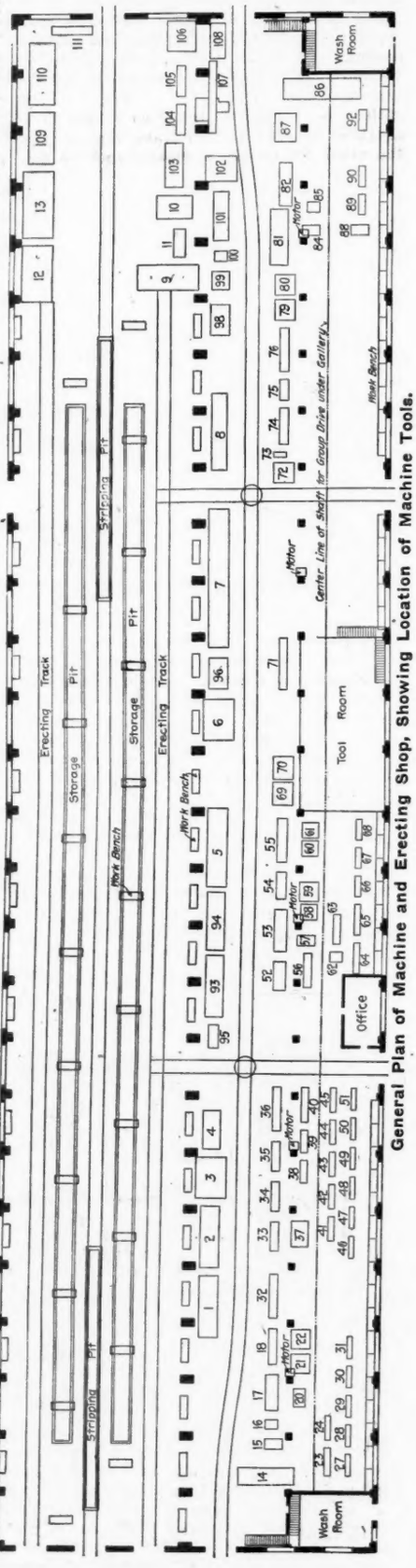
creasing the capacity of the locomotive repair department. It is expected that the shops will be large enough to handle all heavy locomotive work for the eastern district. These shops are the first modern shops built by the Southern.

Ground was first broken in March, 1904, and the contract for the locomotive erecting and machine shop was awarded to J. P. Pettyjohn & Co., Lynchburg, Va. The general layout of the shops is shown in the accompanying illustration. The transfer table pit is 40 ft. wide by 200 ft. long. The smith shop is on one side of the pit and on the other side is the boiler and cab paint shop. The power house is about 50 ft. east of the smith shop. The woodworking shop adjoins the power house, and the two car repair sheds are near the woodworking shop. The new machine and erecting shop is north of the other buildings. The roundhouse has 15 engine pits. It is the intention to increase the capacity of the roundhouse. The coal trestle and coal storage space is south of the roundhouse and is not shown on the general plan. The following table gives the dimensions of the principal shop buildings.

Locomotive erecting and machine shop	150 ft. x 600 ft.
Boiler shop	100 ft. x 102 ft.
Smith shop	90 ft. x 204 ft.
Woodworking shop	90 ft. x 204 ft.
Power house	48 ft. x 115 ft.
Store house	40 ft. x 120 ft.
Office	30 ft. x 40 ft.

The Power House.—The old power plant consisted of a boiler house 43 ft. x 48 ft., which contained four 100 h.p. boilers. These boilers furnished steam for engines which were in the several shop buildings. All the power is now generated electrically in the power house, which has been enlarged by an addition 48 ft. x 72 ft. The addition is of corrugated iron and steel frame construction, built on a concrete foundation. The engine room is 36 ft. x 48 ft. The floor of the power house is heavy concrete. The boiler equipment consists of the four old 100 h.p. boilers which work at 100 lbs. steam pressure and three new 150 h.p. boilers which work at 150 lbs. pressure. The new boilers are made by the Walsh & Weidener Boiler Company, Chattanooga, Tenn. A Stilwell cast-iron open heater, made by the Platt Iron Works Company, Dayton, Ohio, and a Herron pump made by the Herron Pump Company, Chattanooga, Tenn., are also installed in the boiler house. Two brick chimneys 85 ft. high by 6 ft. inside diameter furnish the necessary draft. One of these chimneys is new and was built by the Alphons Custodis Chimney Construction Company, New York. The new and old steam piping is so interconnected with valves that either set of boilers can be used to supply all steam. The pipe and fittings were furnished by the Crane Company, Chicago. The railroad company erected the piping. The engine room equipment consists of two 16 in. and 27 in. x 16 in. Westinghouse compound non-condensing engines. These are direct connected to two 200 k.w. 250 volt direct current Westinghouse generators. Two air compressor made by the Chicago Pneumatic Tool Company furnishes compressed air for the pneumatic tools. No mechanical device has been installed for handling coal and ashes, as colored labor is very cheap in the south. It was thought inadvisable to put in an expensive coal handling system owing to the fact that the plant is relatively small. All the water supply for both the shops and the locomotives at Spencer is procured from the Yadkin river three miles away. The railroad company has a pumping station at the river and from there the water is forced through an 8 in. pipe into a large tank at the shops. The water supply system is to be increased to about double its present capacity.

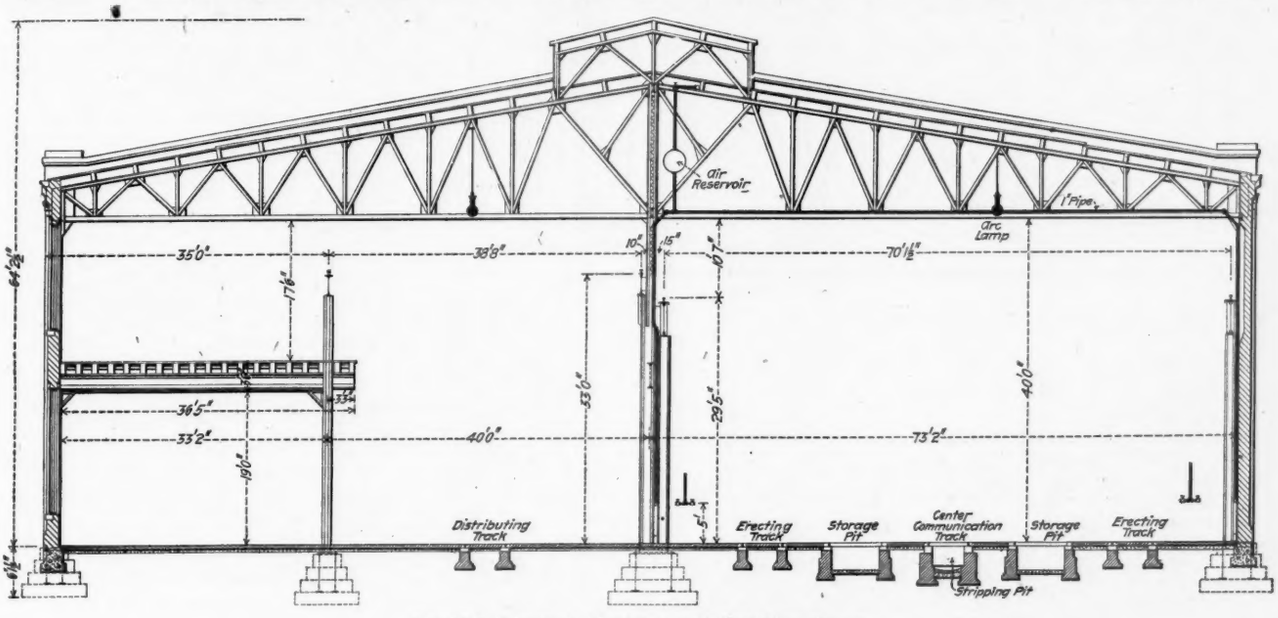
Locomotive Erecting and Machine Shop.—This shop is 600 ft. long by 150 ft. wide and cost about $160,000. The walls are brick on concrete foundations. About 40 per cent. of the wall and roof area is glass, thus giving good natural lighting. The columns and roof trusses are steel and were built by the American Bridge Company. The roof is fitted with Paradigm skylights and the floor is made of vitrified brick placed on edge and filled in with concrete grouting. The erecting shop is on one side of the building. It has two longitudinal erecting tracks each 480 ft. long. By allowing 40 ft. per locomotive it is possible to shop 24 engines at one time on these tracks. The number of sq. ft. of floor space in the machine shop per engine is 3,000 and in the erecting shop it is 1,600 sq. ft., making a total for both the machine and erecting shops of 4,600 sq. ft. per engine. This is a larger ratio of floor space to engine pit than found in any other railroad shop that we know of. On the inner side of each erecting track is a concrete storage pit 4 ft. wide x 4 ft. deep. These pits have drains which connect with the sewer. The central communication track is placed between these pits and passes through the entire building. In the middle of this track and near each end of the erecting track is a stripping pit 100 ft. long. An engine coming in for repairs is run over either one of these pits, the motion work is taken off and the wheels are freed. The locomotive is then taken up by the heavy cranes and placed on either of the erecting tracks. The wheels are then removed by the crane and are taken to the wheel repair department at one end of the shop. A standard gage industrial track passes through the shop midway between the outer edge of the gallery and the center columns. The machine tools are placed as shown in the accompanying illustration, and are both direct and group driven by direct current motors, made by the Northern Electrical Manufacturing Company, Madison, Wis. For direct driven tools, that company's two wire variable speed motor is used. The two wire direct current system using 250 volts is used throughout the shops. A novel and effective method of group drive is used for the tools under the gallery. The system of drive consists of five lengths of shaft each 100 ft. long and each driven by a 20 h.p. motor mounted on a bracket. This bracket, which is shown herewith, is attached to a shop column and the motors are belted to the shafts and tools as shown in the accompanying illustration. Normally each shaft runs independently, but in case one or more of the motors fails, the several sections of shaft can be connected by means of crab clutches. This arrangement is also useful in case more power is required in any of the groups. It is hence practicable when necessary to get from 20 to 100 h.p. in any one group of tools. The heavy machine tools such as planers, slotters, heavy lathes, etc., are placed as shown and are direct driven by individual motors. Some of the lighter tools that are not equipped with motors are driven by means of an ingenious arrangement of shafting secured to the center shop column, as shown in the accompanying illustration. On account of softness of the ground over 92 concrete foundations for machine tools were necessary. On the erecting side of the shop are only heavy machine tools, such as wheel lathes and presses. These are in the corner, as shown, and consist of one wheel press, two new wheel lathes, which are direct motor driven, and two old wheel lathes which it was decided not to equip with electric drive, as it would have cost about $1,000 to fit each of these tools with a motor. The method of driving these machines, which is shown in the accompanying illustration, consists of a 10 h.p. back geared motor running at 215 r.p.m. connected to the countershaft pulley, which runs at 70 r.p.m. This arrangement cost about $400 for



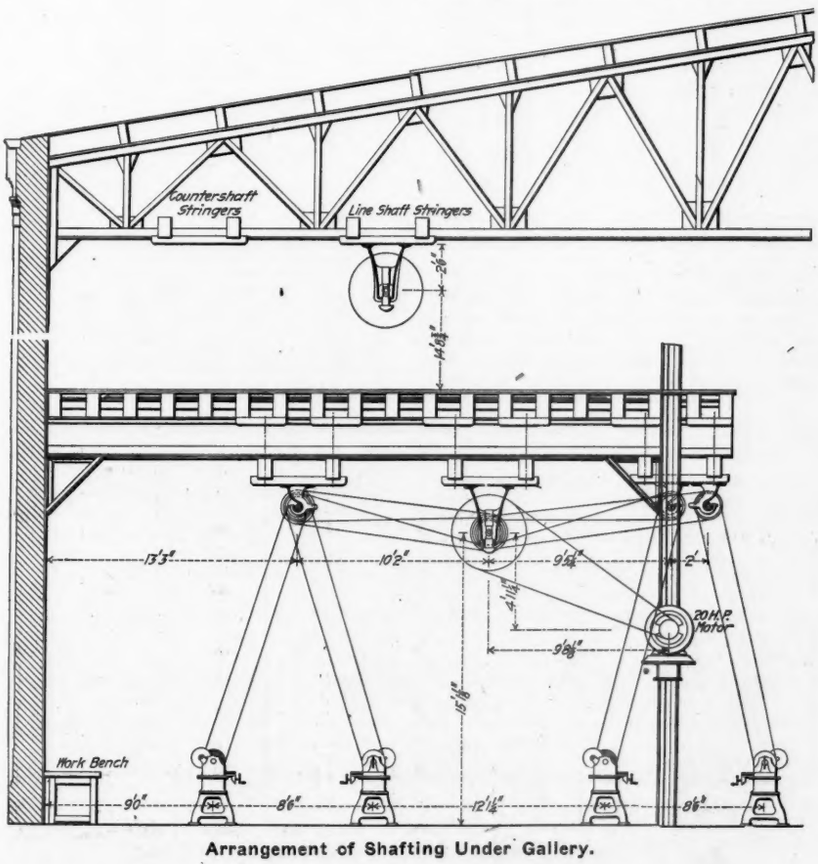
General Plan of Machine and Erecting Shop, Showing Location of Machine Tools.

each tool. Pressed steel pulleys made by the American Pulley Company, Philadelphia, Pa., are used throughout the shop. The accompanying table gives a list of both the direct motor driven tools and the group driven tools in the machine shop and the amount of power required to drive each tool.

The gallery which extends along one side of the shop is 35 ft. wide and has double flooring. The top flooring is ⅞ in. T. G. maple. It has two landing stages for receiving work from the cranes. One end of the gallery is partitioned into two rooms. One of these is used for air-brake repairs and the other for electrical repairs such as motors, electric headlights, etc. On the other portion of the gallery are light machine tools, such as turret lathes, brass working machines, etc., placed in groups electrically driven. The blowers for the Sturtevant heating system are also in the gallery. At each end of the shop and under the gallery is a two-story wash and locker room, 22 ft. x 33 ft., with basins and expanded metal lockers. The tool room is under the gallery, the lower portion of which is enclosed with matched boarding and the upper part is enclosed with expanded metal. Two 70 ft. electric traveling cranes each of 60 tons capacity serve the erecting shop, and two smaller 38 ft. cranes, one of 10 tons capacity and the other of five tons capacity, serve the heavy machine tools on the main floor and also deliver work to the gallery. All four cranes travel the length of the shop. The cranes were furnished by the Shaw Electric Crane Company. Two rows of 13 Toerring arc lights placed midway between the center of the shop and the side walls and spaced 40 ft. between centers are used for lighting the erecting shop. These lights are in line with the bottom of the roof trusses, which is about 40 ft. from the floor. The lights will run 200 hours without attention, and are cleaned from the traveling cranes. Besides these arc lights every machine has a 16 c.p. incandescent lamp enclosed in a wire net. The compressed air for operating the pneumatic tools, etc., is delivered to four air reservoirs supported in the roof trusses. The air is distributed throughout the shop through 1 in. pipes, as shown in the cross section.

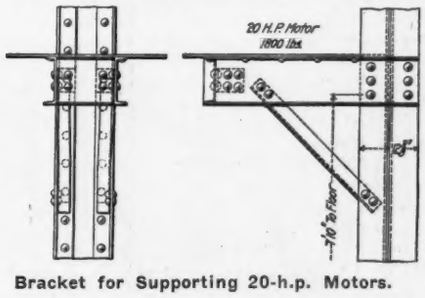


Section Through Machine and Erecting Shop.

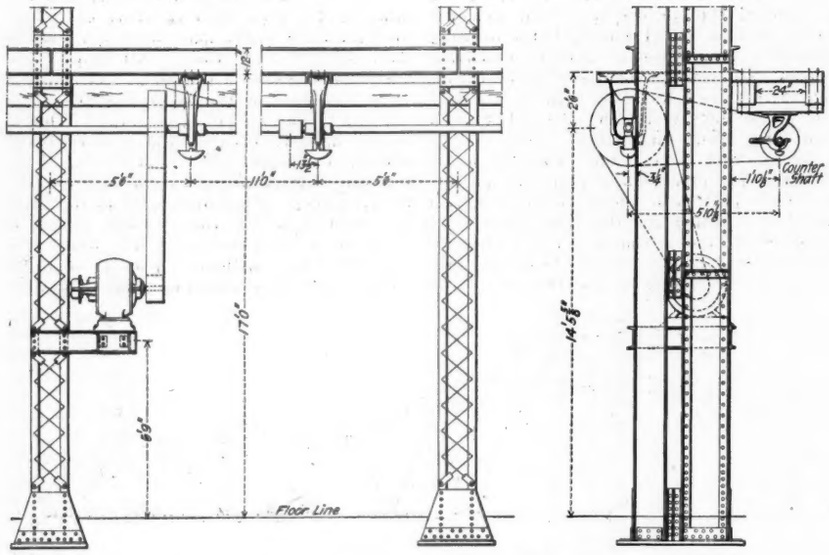


Arrangement of Shafting Under Gallery.

Boiler and Smith Shop.—The boiler shop has been moved from its old location in the smith shop to the building which was formerly used for machine work. This building has been partitioned, one side being used for the cab and paint shop, and the other side is for boiler work. There is nothing new or novel about the boiler shop; in fact, it will strike many, especially western railroad men, as being inadequate in size when compared to the machine shop. Owing to the excellent water the Southern has very little trouble with its boilers in this district, and hence boiler troubles are relatively rare. The smith shop is 90 ft. x 204 ft., and is of steel frame and corrugated iron construction. It is equipped with 38 cast iron forges made by the Ross Meehan Foundry Company,



Bracket for Supporting 20-h.p. Motors.



Arrangement of Shafting on Center Columns.

MACHINES DRIVEN BY INDIVIDUAL MOTORS.

No. of mach.	Kind.	Size.	H.-p.
1	Planer	48-in. x 48-in. x 10-ft.	15
2	Planer	48-in. x 36-in. x 10-ft.	15
3	Radial drill	7-ft. arm.	3
4	D'ble-head shaper	24-in.	10
5	Planer	48-in. x 48-in. x 15-ft.	15
6	Radial drill	7-ft. arm.	3
7	Planer	48-in. x 48-in. x 26-ft.	15
8	Milling mach.	30-in. x 30-in. x 14-ft.	10
9	Planer	60-in. x 60-in. x 10-ft.	20
10	Slotter	26-in.	10
11	Lathe	42-in. x 72-in.	10
12	Driv'g wh'l lathe	90-in.	15
13	Driv'g wh'l lathe	90-in.	18

MACHINES DRIVEN IN GROUPS.

Group No. 1.

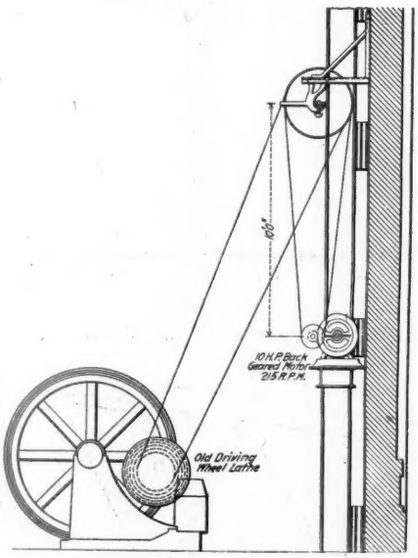
No. of mach.	Kind.	Size.	H.-p.
14	Planer	36-in. x 36-in. x 10-ft.	10
15	Shaper	20-in.	3
16	Tool grinder	——	2
17	Hor. boring mill	60-in.	2½
18	Lathe	30-in. x 84-in.	5
19	Turret lathe	2-in. x 24-in.	3
20	Slotter	12-in.	3
21	Drill press	36-in.	2
22	Drill press	36-in.	2
23	Lathe	22-in. x 84-in.	2
24	Lathe	16-in. x 48-in.	1
25	Turret lathe	——	3
27	Turret lathe	16-in. x 36-in.	1
28	Turret lathe	16-in. x 36-in.	1
29	Turret lathe	16-in. x 36-in.	1
30	Turret lathe	16-in. x 36-in.	1
31	Turret lathe	16-in. x 36-in.	1

Group No. 2.

32	Lathe	30-in. x 132-in.	5
33	"	30-in. x 72-in.	5
34	"	30-in. x 72-in.	5
35	"	30-in. x 72-in.	5
36	"	30-in. x 132-in.	5
37	Shaper	20-in.	3
38	Lathe	22-in. x 48-in.	2
39	"	22-in. x 48-in.	2
40	"	20-in. x 90-in.	2
41	"	18-in. x 48-in.	1
42	"	18-in. x 48-in.	1
43	"	18-in. x 48-in.	1
44	"	18-in. x 48-in.	1
45	"	18-in. x 48-in.	1
46	"	16-in. x 36-in.	1
47	"	16-in. x 36-in.	1
48	"	16-in. x 36-in.	1
49	"	16-in. x 36-in.	1
50	"	16-in. x 36-in.	1
51	"	16-in. x 36-in.	1

Group No. 3.

52	Piston rod grinder	——	3
53	Lathe	50-in. x 96-in.	7½
54	"	36-in. x 72-in.	5
55	"	36-in. x 132-in.	5
56	"	24-in. x 102-in.	2
57	Shaper	20-in.	3
58	Drill press	40-in.	2
59	" "	36-in.	2
60	" "	40-in.	2
61	" "	40-in.	2
62	Tool grinder	——	2
63	Lathe	22-in. x 84-in.	2
64	"	16-in. x 84-in.	1
65	"	16-in. x 84-in.	1
66	"	16-in. x 54-in.	1
67	"	16-in. x 54-in.	1
68	"	16-in. x 54-in.	1



Arrangement of Motor and Countershaft for Driving Old Wheel Lathes.

Chattanooga, Tenn. These are arranged in pairs and placed diagonally as shown. A number of these forges are new, as are also a number of the machines, such as steam hammers, shears, bolt cutters, bolt headers, etc. A liberal number of jib cranes, placed as shown in the illustration, facilitate the handling of work from the forges to the steam hammers. The blast for the forges is carried through overhead pipes directly over the center line of the forges. Each pair of forges is connected to these main blast pipes by a smaller branch pipe. The smoke jacks are placed close to the fires and connect with pipes which pass through the roof and into the open air. This keeps the shop comparatively free from smoke and gas. A standard gage track used for deliver-

Group No. 4.

69	Vert. boring mill	51-in.	5
70	Vert. boring mill	51-in.	5
71	Turret lathe	4¼-in. x 34-in.	5
72	Drill press	42-in.	2
73	Rod bushing press	2-in.	5
74	Lathe	26-in. x 90-in.	3
75	"	26-in. x 48-in.	3
76	Turret lathe	4¾-in. x 24-in.	5
	Machines in tool room		10

Group No. 5.

79	Drill press	13-in.	1
80	Drill press	42-in.	2
81	Planer	36-in. x 36-in. x 10-ft.	10
82	Hor. boring mill	——	2½
84	Shaper	20-in.	3
85	Tool grinder	——	2
86	Planer	48x36-in. x 14-ft. 6-in.	15
87	Shaper	18-in.	3
88	Shaper	20-in.	3
89	Lathe	18-in. x 54-in.	1
90	"	18-in. x 54-in.	1
91	"	26-in. x 48-in.	3
92	Piston rod keyway	——	——
	Cutter	——	1

Group No. 6.

93	Planer	36-in. x 36-in. x 10-ft.	10
94	Planer	36-in. x 36-in. x 10-ft.	10
95	Cold saw	——	5
96	Slotter	20-in.	7½

Group No. 7.

98	Vert. mill'g mach.	20-in.	5
99	Vert. bor'g mach.	37-in.	3
100	Tool grinder	——	2
101	Lathe	42-in. x 144-in.	7½
102	Radial drill	5-ft. 6-in. arm.	2
103	Milling machine	26-in. x 26-in. x 9-ft.	10

Group No. 8.

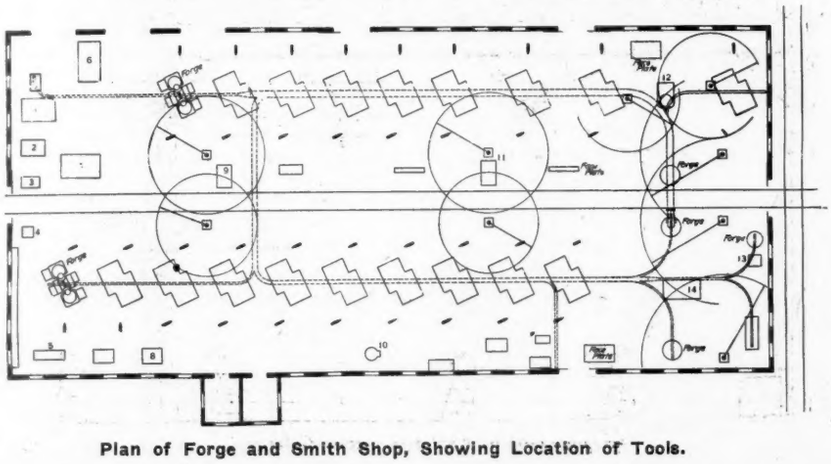
104	Lathe	30-in. x 84-in.	5
105	Lathe	30-in. x 84-in.	5
106	Vert. bor'g mill	84-in.	7½
107	Cylinder planer	——	10
108	Cylinder borer	——	3

Group No. 9.

109	Driving wh'l lathe	78-in.	7½
110	Driving wh'l lathe	78-in.	10
111	Driving wh'l press	——	10

MACHINES IN SMITH SHOP.

No. of mach.	Kind.
1	2-in. bolt header (new).
2	Bolt cutter, (old).
3	Bolt cutter (old).
4	Bolt shear (old).
5	6-spindle nut tapper (old).
6	Punch and shear (new).
7	3½-in. bolt shear (new).
8	200-lb. Bradley compact hammer (new).
9	1,000-lb. steam hammer (new).
10	Trip hammer (old).
11	Morgan steam hammer (old).
12	Beament steam hammer (old).
13	75-lb. hammer (new).
14	3,000-lb. steam hammer (new).



Plan of Forge and Smith Shop, Showing Location of Tools.

ing materials and work passes through the center of the shop as shown.

Owing to the fact that the freight car repair capacity of the Spencer shops is not to be increased it was decided not to make any alterations to the woodworking shop, as its present equipment consists of comparatively modern tools. Practically the only extra work that this shop will be called upon to do is the cab work, and it was not thought that this would be enough to warrant building an addition.

Comparative Cost of Fast and Slow Freight Service.*

BY W. B. POLAND, SUPERINTENDENT, BALTIMORE & OHIO SOUTHWESTERN RAILROAD.

For many years the relative economy of running slow freight trains with engines loaded to maximum capacity, compared with fast freight trains of less than the maximum capacity of engines, has been under discussion. For the purpose of collecting some data on this subject, records were kept on the Indiana Division of the Baltimore & Ohio Southwestern Railroad for the months of January and February, 1904, as follows:

First.—For common freights scheduled to travel about nine miles an hour, rating being assumed as full capacity of engine for this speed.

Second.—For semi-quick despatch freights, it being intended that this class of freight should make an average schedule speed of 15 miles an hour, rating of engines being assumed at 72 per cent. of rating for common freights.

Third.—Quick despatch freights, it being intended that this class of freights should make an average schedule speed of 19 miles an hour, rating of engine being assumed at 60 per cent. of rating for common freights.

The data collected for each of these classes of trains for separate trips was as follows:

(1) Temperature.
(2) Number of engines.
(3) Number of cars.
(4) Number of 1,000-ton miles, no arbitrary allowance being included.
(5) Running time between terminals.
(6) Rate per hour.
(7) Total time between terminals.
(8) Rate per hour.
(9) Cost of operation.
(10) Cost of fixed charges.
(11) Total cost.
(12) Cost per 1,000 ton miles.
(13) Per cent hauled of the maximum rating for common freight.

The "cost of operation" for each trip was obtained from actual cost of wages, overtime, cost of helper engine and fuel, as shown by records of that trip; the number of engine miles per trip multiplied by the total cost per mile, as shown by monthly records for the following items: Running repairs, classified repairs, oil, sand, waste, miscellaneous engine supplies and roundhouse attendants, which amounts to 14 cents per mile for the 1,500-Class engines and 8 cents per mile for the 100-Class engines.

The writer has estimated the average original value of the 1,500-Class freight engines at $11,000 each and that of the 100-Class engines at $9,000 each. An annual allowance of 5 per cent. on the value should be made for interest and 5 per cent. for depreciation, making a total of 10 per cent. per annum. In order that the use of an engine may be justified, it must earn 10 per cent. per annum on the capital invested, and must for each hour of its time be worth a proportionate amount to the railroad company. For the 1,500-Class engines this would equal about 12 cents an hour and for the 100-Class engines 10 cents an hour. This is the fixed charge made against each train for each engine for each hour in transit. The writer has assumed the average value of a freight car to be $800 and on the same basis a car, in order that its use may be justified, must earn 10 per cent. of its value per annum, which would amount to 1 cent per hour. On this basis the fixed charges for the train equipment for any trip would be 1 cent multiplied by the number of cars in the train, multiplied by the number of hours between terminals; plus $0.12 or $0.10 multiplied by the number of engines, multiplied by the number of hours between terminals.

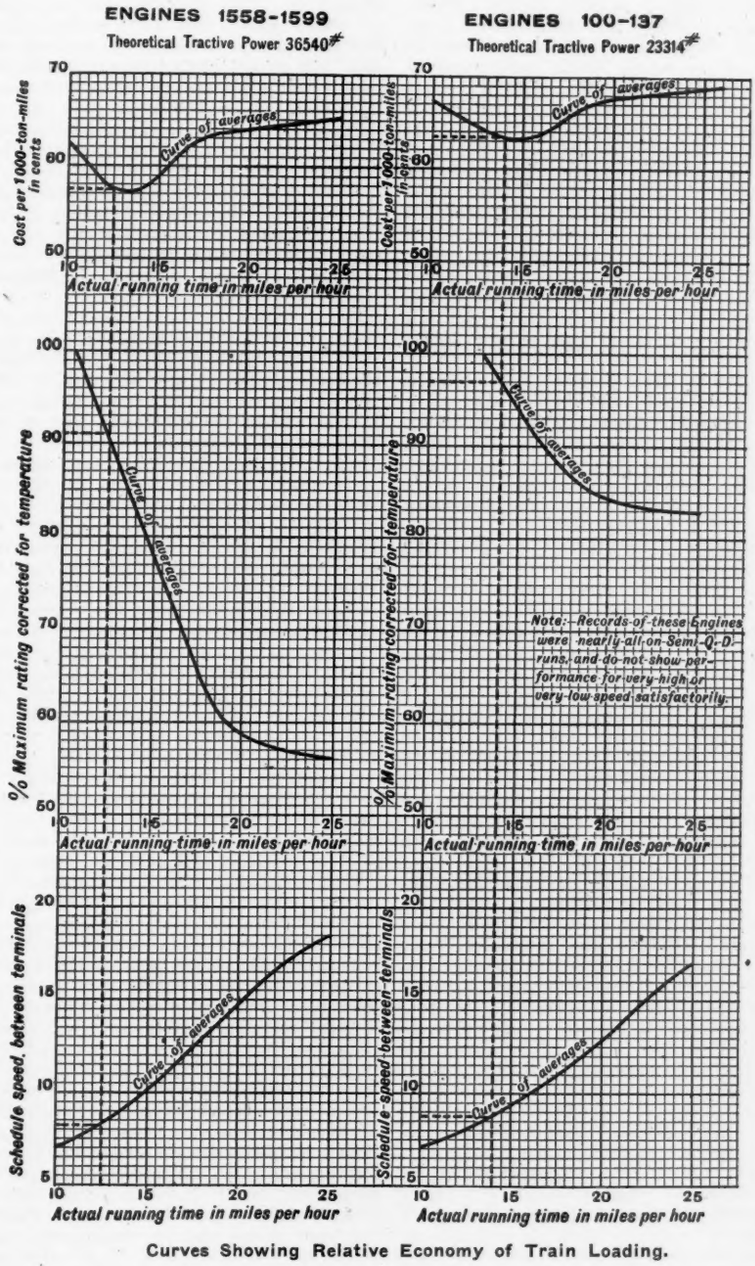
The per cent. of rating handled by each train was obtained from a tonnage statement, by dividing the actual ton-mileage made by the ton-mileage which would have been made had maximum common freight rating, corrected for temperature, been used.

The "total cost" used does not represent the actual cost of handling the train between terminals, but includes only those principal items which vary with, or are dependent upon, each trip. The cost obtained by dividing the total cost by the number of 1,000 ton miles is therefore correct for comparative purposes only.

The above data has been shown graphically on the diagram, as follows:

First.—A chart has been made by plotting the actual running time in miles per hour on the horizontal ordinate and the cost per 1,000 ton miles on the vertical ordinate. The curve of average results indicates the cost per 1,000 ton miles corresponding to given speeds in actual running time.

Second.—A chart has been made by plotting the actual running time in miles per hour on the horizontal ordinate and the percentage of the maximum rating for common freight on the vertical ordinate. The curve of average results indicates the percentage of maximum rating which must be given trains in order that their average speed may


ENGINES 1558-1599
Theoretical Tractive Power 36540#
ENGINES 100-137
Theoretical Tractive Power 23314#
Cost per 1000-ton-miles in cents
Cost per 1,000 ton-miles in cents
% Maximum rating corrected for temperature
Schedule speed between terminals
Actual running time in miles per hour
Curve of averages
Note:—Records of these Engines were nearly all on Sem.-Q.-D. runs, and do not show performance for very high or very low speed satisfactorily.

Curves Showing Relative Economy of Train Loading.

*Reprinted from Bulletin No. 56 of the American Railway Engineering and Maintenance of Way Association.

be a certain running time in miles per hour.

Third.—A chart has been made by plotting the actual running time in miles per hour on the horizontal ordinate and the time between terminals in miles per hour on the vertical ordinate. The curve of average results indicates the relation between the actual running time and the schedule speed in miles per hour between terminals.

From these charts we may see graphically the comparative cost of fast and slow freight service and to a certain extent the relative economy of heavy and light motive power. When it is desired to move freight between given points on this division in a fixed time, it will be possible from these diagrams to determine the rating which must be given engines in order that they may make the desired schedule.

For the 1,500-Class compound freight engines the minimum cost is found at a speed of 13 miles an hour, which requires a rating of 88 per cent. of the maximum; but a speed of 12½ miles an hour does not increase the cost of handling appreciably and will allow 91 per cent. of the maximum rating to be hauled. By referring to the third chart it appears that an actual running time of 12½ miles an hour corresponds with a schedule speed of 8¼ miles an hour between terminals.

For the 100-Class engines the minimum cost is shown at a speed of 15 miles an hour, which requires a rating of 94 per cent. of the maximum; but a speed of 14 miles an hour does not increase the cost of handling appreciably and will allow 97 per cent. of the maximum rating to be hauled. It also appears that a running time of 14 miles an hour corresponds to a schedule speed of 8¾ miles an hour.

From the conditions existing when these records were taken, we should conclude that for the 1,500-Class engines the most economical operation will be attained by trains scheduled at 8¼ miles an hour, running 12½ miles an hour and hauling 91 per cent. of maximum common rating. For the 100-Class engines the greatest economy of operation will be attained by trains scheduled at 8¾ miles an hour, running 14 miles an hour and hauling 97 per cent. of maximum common rating.

The records of about 500 trains given above were taken during a period of exceptionally heavy traffic and also during unusually severe weather, with the temperature in the neighborhood of zero for weeks at a time. It is probable that results in warm weather would be different. It would, therefore, be desirable to make the same determinations under summer conditions and this, it is hoped, will be done later. The determination of the most economical tonnage rating by this method is independent of the rating originally assumed.

The Grand Trunk Pacific.

Recent advices indicate that work on the much talked-of Grand Trunk Pacific will be pushed energetically during the next five or six years, and that possibly an attempt will be made to improve on the record made in hurrying the Canadian Pacific through to the coast. A tremendous task lies ahead of the Canadian Government and the private interests back of the project and the many delays and difficulties encountered in the preliminary work of organization and obtaining government sanction will doubtless fade into insignificance before the innumerable obstacles to be overcome when the actual work of building and equipping the road begins. An editorial in the *Railroad Gazette*, July 17, 1903, pointed out the possibilities of traffic over the proposed line. In the *Quarterly Journal of Economics* for November, Mr. W. L. Mackenzie King has a long article on the new railroad which analyzes in detail the agreement made by the Canadian Government to assist in the construction and comments on the policy of virtual government ownership which is to be tried. We reprint it almost in full below.

The Grand Trunk Pacific Railway Company, the Government of Canada and a private corporation are engaged at the present time in preparing for the joint construction of a railroad which, within the period of a little over seven years, will afford a new highway from the Atlantic ocean to the Pacific, every mile of which will be upon Canadian soil. The original act authorizing this work was passed during the Parliamentary session of 1903, and assented to on October 24 of that year, at the same time that assent was given to the act incorporating the Grand Trunk Pacific Railway Company. The amended act was passed at the session of Parliament held during the present year; and it is under the provisions of the act of 1903 as amended, and an act respecting the Grand Trunk Pacific Railway Company, assented to on July 18, that the work of construction will be carried out.

The Canadian Pacific, begun in 1881 and completed in 1886, is at present the only transcontinental railroad in the Dominion. The construction of any roads south of it for two decades from the time of beginning its construction was prohibited; and in that respect it had a guaranteed monopoly of the trade of the west for this period. In Eastern Canada it is but one of several railroads connecting the more important commercial centers and ports; and, since the completion of the period of its guaranteed monopoly in the west, competitors have entered the field to share with it the increased business of Manitoba and the northwest territories. The competitive lines in the east and the west form in a disjointed way a continuous transcontinental road, connecting the vast, sparsely settled tracts of the west with the more thickly populated commercial and industrial centers of the east. So far, however, as transcontinental traffic is concerned, these railroads operate within an area the commercial requirements of which are served in part by the Canadian Pacific. Neither the Canadian Pacific nor its competitors are so located as to meet the steadily increasing demands of the northward expanding industry, nor so as to be of service in opening up parts of the new territory available for settlement, both in the eastern provinces and in the west, and affording transportation facilities for such territories.

The Canadian Pacific is constructed in part through the United States. That portion from near Agnes in the Province of Quebec to St. Croix in the Province of New Brunswick is in the State of Maine. A perpetual obligation to the Government of the United States, in the nature of a "bonding privilege," is thus incurred. Obligations are a feature odious to the commercial rivalries of nations; and it is felt by many that the friendly political relations between the two countries should not be unnecessarily subjected to a strain which the dictates of a relentless commercialism might render inevitable, should the "bonding privilege" ever become a creature of its caprices.

Political expediency and commercial necessity have therefore been important determining factors in connection with the new national railroad, which is intended to develop commerce through Canadian ports, to secure the most direct and economical interchange of traffic between Eastern Canada and the provinces and territories west of the Great Lakes, and to open new channels of trade from east to west. In the language of the statute creating it, it is to serve as "a new railroad highway across the Dominion of Canada from ocean to ocean," to be directed in its course "with a view to the opening up of new territory to settlement," and to be throughout "wholly within Canadian territory." "It is a work of a national character, necessitated by the status of Canada in the year 1903, just as the Intercolonial Railway was necessitated by the status of Canada at the opening of Confederation, and just as the Canadian Pacific Railway was necessitated by the status of Canada a few years after Confederation."

The prominent feature of the plan of construction of the new transcontinental railroad is the arrangement whereby the government is to construct and own one portion of the road and a private corporation to construct and own the other portion, and, subsequently, subject to certain limitations and payments, to control the operation of the whole. The eastern terminus of the road is the city of Moncton in the Province of New Brunswick; its western terminus, the navigable waters of the Pacific ocean at or near Port Simpson or some other port in British Columbia. The proposed course of the railroad from east to west is to pass through the central part of the Province of New Brunswick and through the Province of Quebec by the shortest available line to the city of Quebec, then through the northern portion of the Province of Quebec and Ontario and through the Province of Manitoba to the city of Winnipeg, from Winnipeg through the Province of Manitoba and Northwest Territories to the Rocky Mountains by a route yet to be determined. It will then pass through the Rocky Mountains to the sea. The portion of the route from Moncton to Winnipeg is known as the Eastern Division, and is to be built by the government. The portion from Winnipeg to the Pacific is known as the Western Division, further divisible, according to the physical features of the district through which it passes into the prairie and mountain sections. This part is to be built by the Grand Trunk Pacific Railway Company, the company incorporated for its construction, and which on its completion will operate the whole road. In its construction of the Western Division the company will be assisted by the State to the extent of certain definite obligations, and some additional liabilities which the government has agreed to accept.

From Moncton to Winnipeg is a distance of 1,800 miles. The work of construction of this part (the Eastern Division, which is the part being built and to be owned by the government) is under the charge and control of four commissioners. The commissioners are empowered to appoint and employ engineers (except the chief engineer, who is appointed by the governor in council), surveyors, officers, servants, agents, and workmen, may appropriate lands required for the purpose, and have, in respect of the division, all the rights, powers, remedies, and immunities conferred upon a railroad company under the Railway Act and its amendments. They may let the work of construction by tender and contract; but members of the House of Commons and Senate are debarred from holding offices of emolument under the commission or from being interested during the period of construction in contracts, on penalty of disqualification. The commissioners have also power to construct such telegraph and telephone lines on the Eastern Division, as may be reasonably required for its operation.

The construction of the Eastern Division is to be commenced at each of the termini, and at Quebec in opposite directions in such a way that the part of the road from Winnipeg to Quebec will be completed as nearly as possible at the time of the completion

of the road from Moncton to Quebec. The commissioners are to issue and deposit debentures with the Minister of Finance in amounts sufficient to pay sums of money for work and services as performed, debentures to be repayable in 50 years from July 1, 1903, and bearing interest at 3 per cent. per annum payable half-yearly, the debentures and the interest thereon to be a first lien and charge upon the Eastern Division, and on all revenue and income after payment of maintenance charges. For the protection of the Grand Trunk Pacific as lessee, a provision is made for the building of this division under the supervision of the company to insure its economical construction.

The commissioners are obliged to render monthly accounts to the Minister of Railways and Canals; to keep books which shall be subject at all times to the inspection of any of the commissioners, the Minister of Railways and Canals, or officers specially appointed by any of these or by the Auditor-General. They are also required to make to the Governor in council, through the Minister of Railways and Canals, an annual report for the information of Parliament. The accounts of the commissioners, in respect of receipts and expenditures, are to be subject to examination and audit by the Auditor-General.

From Winnipeg to the Pacific ocean is a distance of about 1,500 miles. The construction of this Western Division is to be done by the Grand Trunk Pacific; and the work is to be carried on according to plans and specifications to be approved by the government, the work to be completed by Dec. 1, 1911. The construction and equipment of this division is to be on a standard not inferior to the main line of the Grand Trunk between Montreal and Toronto. A deposit of $5,000,000 cash or government securities is required to be made by the company as security for the construction of the division and the first equipment of the whole line, the government to pay 3 per cent. interest on the cash deposit, and transfer the interest on the securities, the deposit to be returned on the completion of construction and equipment.

For the purpose of aiding the company in the construction of this division the government is to guarantee to pay the principal and interest on an issue of bonds to be made by the company for a principal amount equivalent to 75 per cent. of the cost of construction of the division; but such principal amount is not to exceed $13,000 per mile for the prairie section, although 75 per cent. of the cost of construction may exceed this sum per mile. The bonds may be issued in the currency of Canada or sterling money of Great Britain at denominations to be agreed upon, the principal payable in 50 years from the date of issue, which is to be as soon as the Western Division is constructed and equipped ready for operation in accordance with the agreement, provided that the Eastern Division is then also furnished with the equipment required, and that the cash deposit is still unforfeited in the hands of the government. The bonds are to bear interest at the rate of 3 per cent., payable half-yearly. If the company should default in paying interest on the bonds, the government will pay the same, and take up the coupons representing such interest; and the payments so made are to be a charge under the mortgage to be given to secure the guaranteed bonds of the government, which shall be subrogated to all the rights of the holders of the bonds.

On the mountain section, the government is to pay the interest on the bonds, guaranteed for seven years. Thereafter the company is liable for the bonds, principal, and interest, subject to the same conditions in case of default in payment as in the case of the prairie section, with this exception, however, that during the period of three years succeeding the seven, the government shall not be entitled to exercise any rights of foreclosure or sale against the company or take possession of the railroad if the company defaults in payment of interest on guaranteed bonds; but any moneys paid by the government shall be repaid by the company to the government as follows: at the end of the period of three years the whole amount so paid by the goverment to be capitalized and repaid by the company to the government, with interest at the rate of 3 per cent. per annum, or the company may at its option repay the sum in 40 equal instalments with interest or give to the government bonds for the interest so capitalized, payable in 40 years with interest. After the first ten years the government is to guarantee the interest on the bonds until the principal is paid, subject to the same duties and rights in case of default by the company as in the other guarantees.

Upon completion of the construction of the Eastern Division, it is to be leased to the Grand Trunk Pacific Railway Company for a period of 50 years, the company paying therefor a rental of 3 per cent. of the actual cost, and accepting the condition of granting to any other Canadian railroads, running privileges over the line on such terms as may by agreement between the government and the company be deemed reasonable and fair. For the first seven years the government will remit the interest, which is equivalent to granting to the company a cash bonus during that period of time equal to the interest on the cost of construction on a 3 per cent. basis. At the expiration of the lease the government may take possession and operate this part of the road on its own account, or it may lease the line to the Grand Trunk Pacific or other company for a further period of time on terms to be then arranged, subject, however, to the restriction that preference is to be given to the Grand Trunk Pacific in the event of that company agreeing to terms as favorable as those offered by any other company.

The company is to equip both divisions with modern and complete rolling stock, suitable and sufficient for efficient operation and the handling of all classes of traffic to the satisfaction of the government, and at all times during the continuance of the lease of the Eastern Division to maintain efficient service over both divisions of the railroad. The first equipment of the completed road is to be of a value of at least $20,000,000, of which not less than $5,000,000 worth shall be supplied for the operation of the Eastern Division; and this amount of rolling stock, together with all rentals and conditions, is to be marked as assigned to the Eastern Division and held to form part of its equipment for the period of the lease.

Of other features of the agreement between the government and the company, one of the most important is the condition requiring the company to ship all goods consigned to it over Canadian territory to Canadian ocean ports, when not specially directed to forward them by another course, also the condition requiring the company at no time to charge a through rate on export traffic from the point of origin to the point of destination which shall be greater via Canadian ports than via United States ports. The company is also required to provide shipping connections on both the Atlantic and Pacific Ocean ports sufficient in tonnage and number of sailings to take care of and transport all its traffic, both inward and outward; nor is it to permit traffic to be diverted to ports outside of Canada upon the ground that there is not a sufficient amount of shipping to transport such traffic from or to Canadian ocean ports.

The government reserves powers of running and haulage rights over the Eastern Division for the Intercolonial or other lines of railroad and over the Western Division for any lines of railroad, subject to terms of agreement with the company; and the latter is given similar rates over the Intercolonial. The rates to be levied and taken by the company upon any part of the line are to be under the control of the Governor in council or any tribunal authorized by Parliament for the regulation or control of the business of railroads.

The company is required to purchase all materials and supplies for the construction of the Western Division and the equipment of the whole from Canadian producers, where these can be purchased in Canada in the desired quantities and of equal quality upon terms equally advantageous with those procurable elsewhere. The government's guarantee is also made conditional on payment by the company of all just claims of contractors for materials, supplies, and wages incurred in connection with the construction of the road.

The government is to have the right of appointing one director of the company during the term of its lease of the Eastern Division, and so long as the government remains liable for any portion of the bonds issued. Provision is made for arbitrating any points of dispute or differences between the company and the government which may arise, and cannot be otherwise settled between them.

The capital stock of the company is fixed at $45,000,000, of which not more than $20,000,000 is to be preferred, and not less than $25,000,000 common, stock. The Grand Trunk Pacific Railway Company has undertaken that the Grand Trunk Railway Company shall take the full amount of the common stock, except the shares held by directors, which are not to exceed 1,000. But the Grand Trunk is not to be prevented from making any such disposition of the common stock as it may deem expedient, though it is to continue to hold a majority of this stock by such title as shall enable the Grand Trunk to control the policy of the Grand Trunk Pacific during the term of the lease to it of the Eastern Division, and so long as any bonds guaranteed by the government under the terms of the agreement between the government and the Grand Trunk Pacific may remain outstanding.

The Grand Trunk Pacific Railway Company has agreed that the Grand Trunk will guarantee its bonds for the balance required for the construction of the Western Division (exclusive of $20,000,000 required for the first equipment of the road), and the Grand Trunk Pacific is allowed to issue a second series of bonds to be so guaranteed, which are to be a second charge on the property mortgaged to secure the government guarantees.

In case of default by the company a remedy of the government will be in the taking possession of the Western Division through an agent or manager with power to manage and operate the division and to receive the tolls and revenue. It is provided that, in the event of such remedy becoming necessary and being adopted, the manager appointed is to distribute the surplus tolls and revenue after payment of the working expenses *pari passu* between the government or other holders of the bonds secured, in the proportion of 75 per cent. to the holders of the first series and 25 per cent. to the holders of the second series. The right of the government to possession is to terminate if and when the application of the proportion provided of the surplus tolls and revenues shall have paid off all arrears of such interest. There is a further proviso that the

government is not to exercise any of its rights in respect of possession by the company until there has been a default for five years.

A comparison in certain particulars between the terms upon which the new transcontinental line is being constructed with those upon which the construction of the Canadian Pacific was carried out 25 years ago is interesting and instructive. An amount of $25,000,000 in cash, of 25,000,000 acres of public lands, many miles of road already constructed by the government at an estimated cost of $30,000,000, of guaranteed immunity from competition throughout the west by lines to the south for a period of 20 years, extensive taxation exemptions—these are concessions of the earlier undertaking, none of which are to be found in the agreement governing the construction of the present road. To the Grand Trunk Pacific no direct appropriation of public funds has been made, and not an acre of public lands has been granted. The part of the road to be constructed by the government will be retained in its possession and leased. Instead of immunity from competitive rivalry are provisions securing to existing or possible future rivals, running privileges over the company's lines on certain conditions.

No mention is made of taxation, no exemption granted. On the other hand the new road has its bonds guaranteed to the extent of 75 per cent. of their value, receives payment of the interest on the cost of construction of a part of its road for a period of years, and receives also what is virtually a free lease of the government's road for a period of years. Excepting these differences in terms, it would appear that against the uncertainties arising from the limited knowledge of conditions and prospects of a quarter of a century ago, the more certain outlook and probabilities of the present have been weighed. An assured trade with government guarantee would appear to be a present-day substitute for the land and money grants, the monopolies and exemptions, of the past.

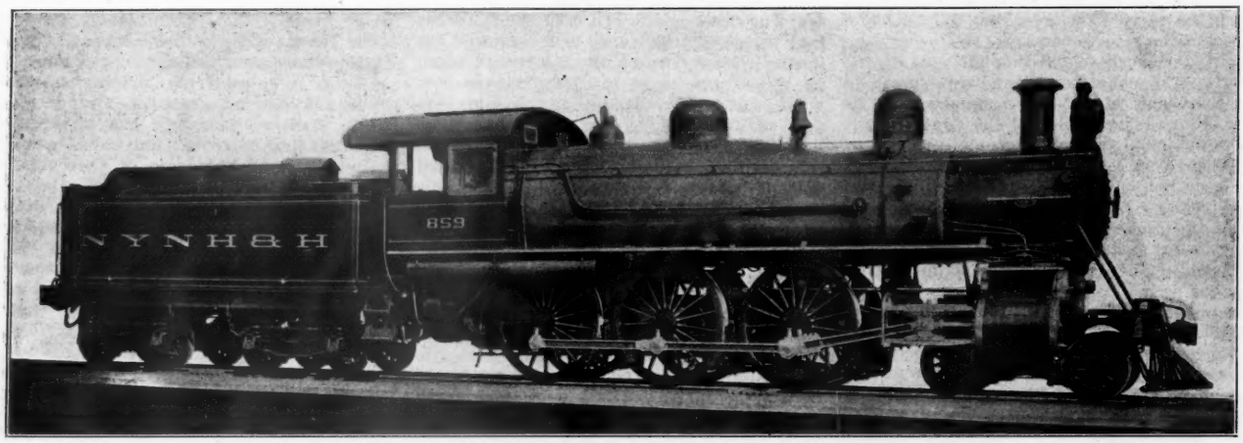
The railroad legislation has been, since the time of its introduction in Parliament, the chief subject of controversy in party politics. The government of the day having created and brought forward the measure, it has found strong indorsement from the ranks of the Liberal party and the Liberal press, though the resignation of his portfolio as Minister of Railways and Canals by the Hon. A. G. Blair at the time the measure was being introduced, on the ground of a difference with his colleagues as to the policy of the government in the matter, was evidence of a conflict of opinion among the government supporters—a difference which has not failed to be made the most of by the opposition (Conservative) leaders and press.

The expediency of immediately proceeding with so vast an enterprise without opportunity being given for obtaining, in fuller detail, particulars as to the country through which the new road is to pass; the advisability of the government undertaking the construction of the less profitable part of the road and undertaking construction at all through a part of the country which is already served by the Intercolonial, a government-owned road; and the greater wisdom of an alternative policy of government ownership of the entire railroad or such parts as it might be deemed advisable to build—are phases of criticism around which the battles of party debate waged while the measure was under discussion in Parliament, and which have been prominent in the electoral contest which has followed its dissolution. Against the policy of delay on the ground of insufficient knowledge of the country through which the road is to pass, the government has argued a possession of ample data on which to base a judgment, the existence of extensive productive areas, vaiuable alike for settlement and exploration, and the urgency of the need to secure at once a sure interchange of products between the east and west. The inadequacy of present facilities was further urged. As to the construction and ownership of the Moncton to Winnipeg part of the road, it has been maintained that its position affords a means of control over the whole which is most desirable, while business is secured to this division by virtue of its location, without the government being obliged to undertake those additional and supplementary enterprises for which a private corporation is better suited, and which, because also of its location, it will be necessary to have carried out in connection with the Western Division. As to paralleling the Intercolonial, it has been pointed out that the route of the new line will be shorter than that of the Intercolonial between Quebec and Moncton by about 180 miles; that the parts of the Provinces of Quebec and New Brunswick which the two lines will serve are not the same, the lines at no point, save the immediate vicinities of the termini, being less than 30 miles apart. It has been urged, further, that the route of the Intercolonial was determined some 40 years ago on the ground of what was politically expedient at the time, and that the trade of to-day should not be forced to inherit with its faults, a condition of things perhaps wise in the past, but which, commercially considered, may be disastrous at the present time.

Against the policy of government ownership of the entire line have been set forth the superior merits of individual ownership in an undertaking of the kind. It has been pointed out that, whatever the advantages of public ownership may be where favorable conditions exist, they are not certain where conditions precedent to commercial success have largely to be created. The construction of wharves and elevators, the employment of commercial agents and agencies in Asiatic countries, the equipment of an ocean carrying service, the erection and maintenance of hotels, and the thousand and one details necessary and incident to the successful creation of a set of conditions which may attract and establish a profitable business for the railroad—all these, it has been alleged, so essential to the financial success of the undertaking, are matters which private investment and management may be expected to direct with greater efficiency and service, and many of them of a nature which it would be undesirable, if not impossible, for a government to perform.

Ten-Wheel Locomotives for the New Haven.

The Baldwin Locomotive Works is delivering 22 new ten-wheel (4-6-0) passenger locomotives to the New York, New Haven & Hartford. Twenty of these engines will have simple cylinders and two will be of the Baldwin four-cylinder balanced compound type. The illustration herewith shows one of the balanced compounds. The peculiar feature is that the connecting rods from all four crossheads drive on the first axle but in this respect the locomotive is similar to the 10-wheel balanced compound built by the Baldwin Locomotive Works for the Plant System (see *Railroad Gazette*, Feb. 28, 1902). The principal dimensions of both locomotives are given in the following table:



Four-Cylinder Balanced Compound—New York, New Haven & Hartford.

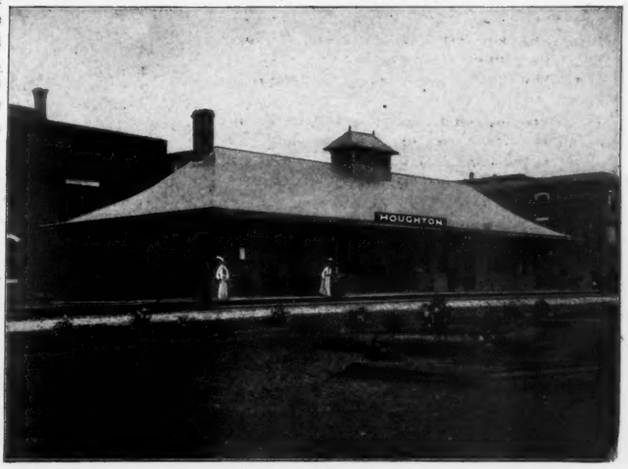
	New Haven.	Plant.
Total weight, lbs.	160,600	176,510
Weight on drivers, lbs.	123,100	127,010
Cylinders, in.	15 & 25x26	15 & 25x26
Diam. of drivers, in.	72	73
Heating surface:		
Fire-box, sq. ft.	168.5	128
Tubes, sq. ft.	2,497.5	2,665
Total, sq. ft.	2,666	2,793
Grate area, sq. ft.	34.7	27.3
Working steam pres, lbs.	200	200
Number of 2-in. tubes	318	341
Length of tubes, ft. & in.	15—1	15—2
Engine wh'l base, ft. & in.	27—5	29—2
Driv'g wh'l base, ft. & in.	13—6	14—1
Tank capacity, gal.	5,500	5,000

The use of 10-wheel locomotives for passenger service is a departure from the usual practice of the New Haven, which has heretofore used the eight-wheel locomotive exclusively for such service.

Passenger Stations of the Duluth, South Shore & Atlantic.

The report of the Railroad Improvement Committee of the American Park and Outdoor Art Association at their St. Louis convention, an abstract of which we published Sept. 23d, made special reference to the stations of the Duluth, South Shore & Atlantic Ry. at Sault Ste. Marie, Marquette and Houghton, Mich. These small-city stations were commended for the fitness of their architecture, and their interior finish and decoration were pronounced harmonious and correct. The condition of the surrounding grounds was also approved. The stations on this road embody the ideas of Mr. W. F. Fitch, President and General Manager, through whose courtesy descriptions have been sent us.

Station at Sault Ste. Marie.



Houghton Station.

So far as possible, native material has entered into their construction, and in each case it has been the aim to provide a station that would meet the particular requirements of the city. For instance, at Sault Ste. Marie, which is a port through which many immigrants annually enter the United States, a commodious and airy waiting room has been provided for their use, while at Marquette the second story of the new building serves as offices for the operating and purchasing departments. These stations are modifications of one general plan, the general arrangement of the three being similar. Such detail alterations were made as were required by the size of the building and the requirements of the public.

The station at Sault Ste. Marie is the property of the Sainte Marie Union Depot Company, composed of the Minneapolis, St. Paul & Sault Ste. Marie and the Duluth, South Shore & Atlantic. It is also used by the Canadian Pacific as a tenant. It stands facing the St. Mary's Falls ship canal, through which the Great Lakes passenger and freight traffic passes and along which the United States Government maintains a park. With a neat little park at each end, the station is an interesting and attractive waiting place for travelers. It is 187 ft. long and 44½ ft. wide, and is built of brown sandstone quarried at Rock River, Mich. It is one story high with the exception of the central portion, which is two stories. The upper floor is occupied by the telegraph office, living rooms and the kitchen, serving the dining room below, with which it is connected by a dumb waiter. This kitchen is so situated that waiting passengers are not offended by the odors from it. The platform on all four sides is protected by an overhanging roof.

The interior is particularly well arranged and even the smallest space has been utilized. In the east end is the general waiting room, with ladies' retiring rooms and men's toilet partitioned off at the extreme east. The toilet rooms have tile floors and wainscoting and sanitary fixtures with marble slabs. The waiting room and ladies' rest room are finished in quarter-sawed oak and the walls are tinted olive green. The ceiling is beamed with oak, with electric lights at the intersections. The spaces between the beams are also tinted green. In the northwest and southwest corners respectively, are offices for the superintendent of dining and sleeping cars and the ticket clerk, with an opening into the baggage room between them.

West of the general waiting room is the baggage room, next to which is the lunch room. Beyond that is a transfer room occupied by the express company, and at the west end is the immigrant waiting room, 40 ft. x 56 ft., which is finished in Georgia pine. The walls and ceiling are finished similarly to the general waiting room, and there are toilet rooms for men and women. The station is lighted by 165 incandescent lights and is heated by steam, the plant being situated off to one side. Platforms extend around the whole structure and out between the tracks at the south side, where the trains arrive and depart.

The Marquette station is a two-story building, 105 ft. x 35 ft., and is built of brown sandstone from quarries at Fort Wing, Wis. It was opened to the public Dec. 23, 1901. It stands back a short distance from Marquette's main street, from which it is separated by a greensward maintained by the company. The first floor is devoted to waiting room, ticket office, toilet rooms and baggage room, and the second floor is used for offices. The main portion of the first floor is included in the general waiting room, which is 68 ft. long, with ladies' retiring rooms at the extreme east. It is finished in red birch and the walls and ceiling are finished in green with wainscoting of lincrusta walton in red. The ceiling is beamed with red birch with electric lights at the intersections, and the ladies' rooms are similarly finished. On the south side of the waiting room is the ticket office and on the west side is the men's toilet; also an opening into the baggage and parcel room. West of the waiting room are stairways to the sec-

Marquette Station.

Interior of Waiting Room, Marquette Station.

ond floor from both the north and the south side of the building with exterior entrances. The extreme west of the building is used as a baggage room.

The building is heated by steam, from a plant in the basement, which also furnishes steam for the coach yard to the south of the depot. There is a platform about the entire building, which is protected by a veranda supported by brackets, on each of which there is an electric light. In external appearance the building is plain, though there is an immediate impression of utility and convenience in design and arrangement.

In general appearance, the Houghton station is similar to the one at Marquette except for the second story. It is 102 ft. x 22 ft. and is built of red sandstone quarried at Portage Entry, Mich., and was formally opened Nov. 2, 1903. It is steam heated and electric lighted and faces Portage Lake, the space between the two being used by the company for tracks and for park purposes. In the west end of the building are the ladies' rooms. At about the center, on the north side is the ticket office, and at the east end the men's toilet. Beyond that is the baggage room. The center of the building is taken up with the general waiting room, finished in red birch. The walls and ceiling are tinted green, and the ceiling is beamed with red birch with electric lights at the intersections. The platforms are protected by an overhanging roof.

In each of the three buildings the furniture of the waiting room is of the same material as the finish of the room. There are the customary settees, with rocking chairs provided in the ladies' rooms. All floors are hardwood; in fact, all material used and the workmanship have been of the very best. There is nothing unusual or gaudy in either the architecture or the interior finish and therefore nothing to offend the taste of any class of people.

We are indebted to Mr. G. W. Hibbard, General Passenger Agent, for information and illustrations.

Accidents in the United States in October.[1]

†rc, 2d, Northern Pacific, Driscoll, N. Dak., an eastbound stock train which was standing at a water tank was run into at the rear by a following freight train, wrecking the engine and several cars. Three passengers in the caboose of the standing train were killed and three were injured.

rc, 2d, Nashville, Chattanooga & St. Louis, White Bluff, Tenn., a freight train ran into the rear of a preceding freight, making a bad wreck. A man lying asleep in the caboose was killed and two other trainmen were injured.

unf, 3d, 2 a.m., Chicago, Burlington & Quincy, Altona, Ill., a fast mail train was derailed by the door of a freight car which had fallen upon the track, and four trainmen and one mail clerk were injured.

rc, 4th, Lehigh Valley, Meshoppen, Pa., a local freight train standing at the station was run into at the rear by a following freight, and three trainmen were injured, one of them fatally

*unf, 5th, Augusta Southern, Mitchell, Ga., passenger train No. 6 broke through a trestle bridge which had been weakened by fire, and the tender and three cars, with the bridge, were burnt up. The baggageman was killed and three trainmen and two passengers were injured.

eq, 5th, Norfolk & Western, Ingleside, W. Va., a freight train was derailed by a broken flange and 22 loaded cars were wrecked. Two trainmen were killed.

o, 5th, Southern Railway, Charlotte, N. C., the caboose of a freight train was crushed by a pushing engine behind it, in consequence of the sudden stoppage of the train by the automatic application of the air-brakes. Three trainmen were killed.

o, 5th, Lake Champlain & Moriah, Mineville, N. Y., a locomotive was wrecked by the explosion of its boiler, and the engineman and fireman were killed.

rc, 7th, Lehigh Valley, Falling Springs, Pa., a passenger train ran into the rear of a preceding freight, wrecking five cars of fruit and overturning the engine; engineman and fireman injured.

bc, 7th, Pittsburg, Cincinnati, Chicago & St. Louis, Hanlins, Pa., butting collision between a passenger train and an empty engine, wrecking both engines. The fireman of the passenger train was killed and three other trainmen were injured The collision was due to a misunderstanding of instructions by the men in charge of the empty engine, who ran west on the eastbound track and ran past a block signal.

bc, 8th, 10 p.m., Southern Pacific, China, Texas, butting collision between Sunset Limited passenger train No. 9 and eastbound fast mail train No. 8. Eight passengers were injured.

xc, 8th, 9 p.m., Erie road, Port Jervis, N. Y, collision between a work train and a freight, wrecking one engine and 12 cars. Three trainmen and two tramps were injured.

bc, 9th, Northern Pacific, Garrison, Mont., butting collision of freight trains, wrecking both engines and many cars. One fireman was killed and two other trainmen were injured.

†bc, 10th, 4 a.m., Missouri Pacific, Warrensburg, Mo., butting collision between an eastbound passenger train and a westbound freight, wrecking both engines and many cars, and completely crushing the leading coach of the passenger train, which was next to the engine. Twenty-nine passengers and one brakeman were killed and 60 passengers were injured, some of them fatally Both trains were running at full speed. The freight train had waited at Knobnoster 1 hour, 40 min. for passenger trains No. 10, first No. 30, and No. 50, but for second No. 30 it did not wait, and with this it collided. It appears that the men in charge of the freight did not carefully note the passing passenger trains.

*†eq, 10th. Southern Pacific, New Iberia, La., a freight train was derailed by a brake-beam which became loose and fell to the track, and 14 cars were piled up. The wreck took fire and was mostly burnt up, and a produce dealer who was on the train to take charge of a carload of fruit was killed.

dn, 10th, Southern Railway, Saluda, N. C., a passenger train descending a steep three-mile grade (237 ft. to the mile) became uncontrollable and was run upon one of the "catch points," or safety switches, with which this line was recently fitted; but the speed of the train was so great that the engine went off the end of the track, although at the far end it rises at the rate of 11 ft. in 100 ft. No person was injured.

xc, 11th, Pennsylvania road, Bordentown, N. J., a passenger train ran into the side of a freight train, and the engine was overturned. Six passengers and three employees were injured.

unx, 13th, Southern Railway, Lancaster, S. C., a freight train broke through a trestle bridge and the engineman and fireman were injured.

xc, 14th, 7 p.m., New York Central & Hudson River, Rensselaer, N. Y., the Empire State express, eastbound, collided with an empty engine, and the fireman of the latter was killed.

bc, 15th, Denver & Rio Grande, Beaver Creek, Colo., butting collision of passenger trains; two trainmen injured.

unx, 15th, Southern Pacific, West Fork, Ore., the rear car of a passenger train, which was a sleeping car, was derailed and fell down a bank. Three passengers were injured.

xc, 17th, Erie road, Binghamton, N. Y., collision of freight trains in the yard, making a bad wreck. Three trainmen were injured.

bc, 18th, Southern Railway, Bird's Eye, Ind., butting collision of freight trains, wrecking both engines and several cars and knocking down the station building. One engineman was killed.

dr, 18th, Atlanta, Knoxville & Northern, Talona, Ga., a freight train was derailed and four cars were ditched. The engineman was fatally scalded and the fireman seriously injured. It is said that the derailment was due to a defective rail.

eq, 18th, Lake Erie & Western, Gilman, Ind., a freight train was derailed by the breaking of a wheel, and a brakeman was killed.

rc, 19th, Cleveland & Pittsburg, Beech Creek, Ohio, rear collision of freight trains, wrecking 10 cars. The fireman and one brakeman were killed and another trainman was injured. There was a dense fog at the time.

dr, 19th, 5 a.m., Georgia Railroad, Decatur, Ga., passenger train No. 3 was derailed at a point where track repairs were in progress, every car going off the track and some of them being ditched; but one passenger and the mail agent are the only persons reported hurt.

*rc, 20th, Southern Pacific, Yuba Pass, Cal., westbound passenger train No. 3 ran into the rear of freight train No. 115 in a snowshed, wrecking the caboose and several freight cars and knocking down parts of the shed. The wreck took fire at once and four carloads of cattle and several other freight cars, with 2,000 ft. of the shed, were burnt up. Superintendent R. J. Laws dropped dead during the clearing up of the wreck.

bc, 21st, New York Central & Hudson River, Geneva, N. Y., butting collision of freight trains, wrecking three engines and several cars. One engineman, one fireman and an apprentice fireman were killed. The southbound train ran past a block signal set against it.

bc, 21st, Missouri Pacific, Chetopa, Kan., butting collision of passenger trains; 17 persons were slightly injured.

xc, 21st, 10 p.m., Central of New Jersey, White House, N. J., collision between a coal train and a milk train, wrecking both engines and 30 cars. One fireman was killed. The collision is said to have been due to one of the trains becoming uncontrollable on a steep descending grade.

bc, 23rd, 1.22 a.m., Yazoo & Mississippi Valley, Stampley, Miss., butting collision between a northbound passenger train and a southbound freight, making a bad wreck. Three trainmen were killed and one was injured. The collision was due to the failure of the passenger train to obey an order to wait at Stampley until 1.30 a.m. for the freight.

unx, 25th, 1 a.m., Missouri Pacific, Neal, Kan., passenger train No. 42 was derailed and the first three cars were overturned. The express messenger and 15 passengers were injured, most of the passengers slightly.

unx, 25th, Augusta Southern, Warthen, Ga., a freight train was derailed and the caboose was ditched. The conductor was killed and a brakeman injured.

xc, 25th, Cleveland, Cincinnati, Chicago & St. Louis, Anderson, Ind., a freight train collided with a switching engine in the yard, wrecking both engines and 12 cars. One brakeman was injured. It is said that the collision was due to the failure of the light in a lantern with which a brakeman of the

[1] Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in *The Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defects of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

switching engine was trying to stop the freight.

unx, 26th, Wabash road, Sadorus, Ill., a freight train was derailed and wrecked and five tramps were killed.

xc, 26th, Cleveland, Cincinnati, Chicago & St. Louis, Jonesboro, Ind., a freight train collided with some freight cars which were on a side track but not clear of the main line; one brakeman was killed and two other trainmen were injured.

*xc, 26th, 4 a.m., Erie road, Tuxedo, N. Y., a freight train just starting from the station was run into at the rear by a following freight and 15 cars were wrecked. The wreck took fire and was partly burnt up.

rc, 27th, Chicago, Milwaukee & St. Paul, Minneiska, Minn., a passenger train collided with the rear of a preceding freight, wrecking the engine and several cars. The express messenger was injured and two tramps were killed.

o, 27th, Chicago, Burlington & Quincy, Lincoln, Neb., a passenger train ran into and demolished a wagon containing oil, which was crossing the line at a grade crossing, damaging the engine. The engine and first two cars were at once drenched with oil, which took fire from the fire in the engine, and the engineman and fireman were burned to death.

eq, 28th, Erie road, New Hampton, N. Y., an excursion train was derailed by the breaking of one of the axles of the tender. Three persons were injured.

dn, 29th, 9 a.m., Northern Pacific, Lind, Wash., eastbound passenger train No. 2 was derailed and all of the cars except two sleeping cars fell down a bank. It is thought that insecure rails at a point where the track was undergoing repair were the cause of the derailment. Eight passengers were injured.

†rc, 30th, Missouri Pacific, Tipton, Mo., a passenger train which was standing at a tank was run into at the rear by a following passenger train, crushing the rear car of the leading train. Three passengers were killed and 10 others were injured. It is said that the second train was running at 25 miles an hour, in violation of the rule to keep speed under control at this point.

dn, 30th, Nashville, Chattanooga & St. Louis, Murfreesboro, Tenn., passenger train No. 5 was derailed at a misplaced switch and the engine was overturned. The engineman was badly scalded and an express messenger was injured.

Factors Affecting the Vision of Enginemen and Firemen.*

Controlling trains by block signals requires, in the daytime, the determination of the position of a semaphore arm, about 4 ft. long by 6 in. wide, or distinguishing the color of a disk about 17 in. in diameter, displayed on a pole about 26 ft. high. At night the color of a 6-in. lens, lighted by a kerosene lamp, must be observed. This must be determined by the enginemen at sufficient distance in which to control their trains. On a train at speed a signal must be read at not much less than one-half mile. The writer rode considerably over 5,000 miles in the cabs of engines on various roads, at all times of day and night, and in all kinds of weather, to obtain data as to visual requirements of enginemen and firemen, and arrived at the conclusion that the best known standard of binocular single vision and color perception is none too good, and it must be quick vision. There are so many conditions that severely test the best vision and color sense that a person with these faculties diminished to even a small extent is a great source of danger. Escaping steam often completely envelops the engine and cab. Steam and soot from the smoke-stack is blown back against the cab windows, covering them with steam and dirt and making it next to impossible to see through them, to say nothing of obtaining a view of anything through the condensed steam and smoke. This is especially true in passing under the viaducts or bridges entering the railroad yards of large cities, where there are many moving engines and trains, and signals must be closely watched for. In freezing weather the escaping steam is especially bad, as the windows are coated with ice, and seeing through them is out of the question. The escape of steam inside the cab in cold weather often coats the side windows with frost and ice, but rarely the front ones, as the rush of cold air against them while in motion keeps them clear. Double glass is also used, with an air space between, which prevents their freezing. The dust raised by passing trains often coats the windows, especially if they are damp from escaping steam; the engineman's position, being on the right side, escapes most of this, however, on roads which run their trains right-handed on double tracks. The cloud raised from ploughing through snow drifts shuts off all vision for the time. Some considerable complaint is made of the drivers throwing mud and dirt on the front windows in moist weather.

The glare from the furnace door when the engine is stoked makes the reading of signals much more difficult. There is an iron shield above the furnace door on the engineman's side, which protects him somewhat. Many enginemen have their seat curtained off to relieve them of this glare. After looking into this glow from the position of a fireman during the time required to shovel in five or six shovels of coal, it is an utter impossibility for a novice to read a signal. There was a black scotoma before my eyes, the size of the furnace door, for fully 10 minutes, and I could distinguish nothing except eccentrically. Firemen have told me they could not even see their steam gage for several minutes after a stoking, and when one takes into consideration that from three to ten tons of coal are handled in a two to five hours' run, there is not much let-up from looking into the fire-box, and when this is done daily for five or six years, or even longer, before a fireman can expect to become an engineman, it must be a good pair of eyes that can stand it and pass the required standard examination for promotion, without a rest or change.

The divergent rays from the headlight make it more difficult to read signals if there is fog, snow or mist in the air; with the electric headlights, while they are of the greatest advantage in all other ways, this is much more aggravated; an immense disk of reflecting and refracting particles is directly before one, and it is almost impossible to distinguish signals through it. If these headlights were built on the same principle as the searchlights of the navy, so that they would throw parallel rays and could be deflected to strike the track at say 100 yds. distance in front of the engine, they would be greatly improved. This effect was obtained on the Burlington by Mr. J. A. Carney, Master Mechanic, by making an extension to cut off the divergent rays and stopping the light down with a diaphragm. An 18-in. extension with the light stopped down to a pencil about 9 in. in diameter made a perfect light.

It is impossible to estimate distances accurately behind an electric headlight, or to tell how far off an oncoming train lighted with one is. The effect on the eyes of looking into an approaching electric headlight on double tracks is very much the same as looking into a searchlight, but it is unnecessary for enginemen to look directly into the source of light. In fog, snow, mist and rain night signals are seen at a greater distance than day. The foreground and background of day signals make a great difference with their being easily seen. A sky background is the ideal; the kind of day does not seem to make much difference. Signals displayed on roads running through mountainous country, and especially where there are many curves in valleys, are very hard to distinguish from the elevated position on either side. Woods stripped of their leaves or in full foliage, the proximity to buildings and bridges, all tend to make the position signals less distinct, while the cross-bars of telegraph poles are very confusing. Undoubtedly night signals are much easier read, as the contrast is so much greater, but as to their being seen any further, or so far, atmospheric conditions being the same, is questionable. The reflection from snow, from a body of water, from the solid green of foliage, running toward the sun when near the horizon, the shimmer in the atmosphere on hot summer days, all are features which add much to the difficulty of seeing signals.

Lenses of various colors were experimented with in looking into the fire-box from the fireman's position, and then trying to read day and night signals. Red, blue, green and smoked glasses were useless or worse, but a light amber lens gives a perfect result. I could look into the fire-box of the large type engines, see all parts distinctly, relieved of the blinding glare, see about the cab perfectly, climb on the seat with no spot before my eyes, and the signal lights maintain their clear definition of color, white being tinged a slight yellowish. The green light cannot be seen at so great a distance as with the naked eye, but red and white can be seen an equal distance and with equal distinctness.

Men exposed to the heat and glare of furnaces or of molten metal suffer some diminution in vision of the eye most exposed, i.e., the left in right-handed men, and vice versa, but this is very rarely permanent, as a change and rest usually brings about complete restoration of sight. A number of firemen have volunteered the information that they had passed their entrance examination all right, but when they were re-examined after four or five years' service their left eye was not so good as the right, which is the one next to the fire-box in stoking.

Protection of some kind is the only method of overcoming the effect produced by the impact of snow, mist, rain and wind against the eye, and all sorts of devices are resorted to. Fully 90 per cent. of the men questioned admitted they carried some form of protection glass for such an emergency. With lenses before my eyes I found no difficulty in facing the worst storms; the glasses did not become dimmed enough to prevent sufficient vision to read signals at any distance they could be made out with prevailing weather conditions, and the condition of the eyes were infinitely better. The larger the lenses the more perfect the protection. Fogging only occurs when going from a cold air into a warm one, and within five seconds after contact with cold air the lenses are clear again. This point, however, is one small factor against the use of glasses by trainmen, as the engineer is unable to see distinctly about his cab for the few moments his glasses are fogged, after contact with cold, but he is equally unable to see for the same length of time as a result of coming in contact with snow, rain and wind with the naked eye. The lenses also protect the eyes from the flying coal dust in the cab. The reflection from snow, from a body of water, the sun near the horizon, and the shimmer on hot days, was best overcome with the amber lenses. The difference in the care taken of the lamps is very marked over 40 or 50 miles of road.

Comparative tests were made of different

*Abstract of a paper presented at the November meeting of the Western Railway Club by Dr. Nelson M. Black, of Milwaukee.

makes of roundels used in signal work. It was found that the difference in intensity of color of a signal was due in a great many cases, not to the care taken of the lamp, etc., but to the poor quality of the roundels themselves, there being a difference of 77 per cent. in the amount of the original illumination transmitted by the poorest and best; spectroscopically, the difference between 17.4 per cent. and 73.1 per cent. of pure red light transmitted by the red roundels, and 13.2 per cent. and 30.2 per cent. of pure green light by the green roundels. (These tests have been reported in the *Railroad Gazette.*)

Following this part of the paper is a discussion of the reports which have been adopted by representative medical societies as to standard vision and hearing required by trainmen, there being four such reports. These reports vary little in essential features and the author advocates the adoption of a uniform report, in order that uniformity in examination among the different roads be arrived at. The more important sections are then discussed singly. The section referring to the minimum requirements for acuteness of vision is declared to be the most important and all the reports agree that 20/20 (6/VI) vision in each eye without glasses shall be required for entrance into service or promotion.

Dr. Black then goes on to tell of the studies and investigations which have been made of this subject by Doctors William Thomson, of Philadelphia; Charles H. Williams, of Boston, and others. With this part of Doctor Black's subject readers of the *Railroad Gazette* are already familiar.

Continuing the speaker said: If the vision of men examined for promotion after five years' service and those re-examined in service falls below the standard required, and such vision could be brought up to the required standard by glasses, they may safely be promoted or retained in service. Glasses must be worn if they are necessary to secure adequate vision. Protection to the eyes by lenses, more especially if needed to correct any refractive error, is of great benefit.

Some of Dr. Black's conclusions are: The best known standard of visual acuity and color perception should be required of men concerned in the active operation of trains.

The signal systems now in vogue, while they are not perfect, are sufficiently adequate for the standard of vision required and the present speed of trains. . . .

Glasses are not a hindrance to enginemen, and their use should be allowed when required to protect the eyes or to bring the vision up to required standard, but no person should be accepted into service requiring them or who will accept a plus lens of 1½ or 2 D. . . .

A suggested uniform code of tests and requirements is appended to the paper.

A very large proportion of the administrative officers of the Prussian State Railroads (and of other State administration corps) are lawyers, or rather, are graduates of the law departments of the universities; for very few of them have ever "practiced law," as we understand it; and most of them contemplated an administrative career when they studied. Naturally, something more than strictly legal knowledge is desirable for railroad service; and something more seems to be required; for the deans of the law faculties of the universities have given notice to the students that henceforth the Minister of Public Works will not consider any applications of law graduates to enter the railroad service unless they can show that they have thoroughly studied political economy, the science of finance, social political legislation and technology.

Railroad Commissioners' Convention.

The sixteenth annual convention of the National Association of Railroad Commissioners was held at Birmingham, Ala., November 15 and 16. The President of the Association, Commissioner John V. Smith, of Alabama, in his opening address presented an argument against State railroad ownership. The association, after listening to the report of the executive committee, which dealt with the question of damages for personal injuries, voted to instruct the executive committee to prepare a bill to be presented in the various State Legislatures defining the rights of each party in such cases. The association also favored the proposition that legislation should be enacted in each State to restrict the building of unnecessary competitive railroads.

The committee on uniform classification and simplification of tariffs reviewed the subject in the light of what has been said upon it in past years, and declared that the people still demand uniform classification of freight; and it was recommended that the Interstate Commerce Commission be asked to again investigate the whole subject. Professor B. H. Meyer read a paper on the valuation of railroads in the United States, discussing the different methods adopted by different public authorities in estimating the value of railroad property. He said that a compilation is now being made of statistics relating to each railroad, which it is hoped will throw light on the problem of making a satisfactory general rule for valuation.

The committee on legislation reviewed the general conditions of Federal legislation and declared that the need of Federal control over rates is just as important as is the similar need in 20 or more States which have met the problem by empowering their railroad commissions to regulate rates.

The committee on safety appliances made a report endorsing the arguments presented to Congress by the Interstate Commerce Commission in its last annual report, and recommending the passage of the bill for the compulsory use of the block system which the commission presented at that time. The essential parts of the report follow:

The existing situation, taking the country as a whole, may be described in a few words. Most of the principal railroad companies have the block system in use on parts of their lines, but the aggregate mileage of road block signaled is less than one-fifth of the total in the country. Collisions continue to occur with painful frequency, and the use of the block system is extended but slowly. Some few roads have made considerable extensions during the past year, but on others, and in all parts of the country, important lines remain without block signals.

As to the best method of block signaling it would be out of place for this committee to express an opinion. Any of the different arrangements used could be recommended as immeasurably better than the continuance of the old methods—time-table, time interval, flagging and torpedoes. As between the different automatic devices, the question of excellencies or defects is a delicate one, because in many features the apparatuses of rival manufacturers or patentees differ from one another chiefly in details; in those details of construction or operation which are understood only by men intimately acquainted with them—the inspectors and maintainers employed by the railroad companies. The testimony of these inspectors and maintainers has not been collated in available form. Wherever block-signaling methods or apparatus are at all unsatisfactory the fault is much more likely to be found in the methods of administration or of care taking and inspection than in the mechanical construction of the devices or the principles laid down for their operation. Much of the non-automatic block signaling in this country is carried on with an insufficient equipment of apparatus. While it is possible by constant care to carry on the work with a degree of success in spite of this deficiency, it would be manifestly wrong to recommend for adoption any arrangement not provided with all of the generally approved signals, distant signals and accessories.

In the matter of legislation this committee can do no better than recommend that this convention give its unqualified indorsement to the proposition made by the Interstate Commerce Commission to Congress in its seventeenth annual report, presented last December. That proposition embraced a draft of a proposed law, a copy of which is appended hereto. The Commission based its recommendations on well-settled experience in England, where the block system has been universal for many years, while at the same time the conditions in this country were at every step fully considered. It is much to be desired that a statute like that proposed to Congress be proposed and adopted in each State; but in view of the fact that public opinion on the subject has not yet become thoroughly crystallized, it would seem best to concentrate attention and effort on the national legislature, at least for the present.

. . . We may summarize our conclusions by saying that only a small part of the railroad mileage of the country which ought to be block-signaled is block-signaled, the railroads themselves being judges; that simple unpatented methods and apparatus are available, and that the strong arm of the law is needed to bring about a satisfactory degree of progress in this greatly needed improvement. The suggestion that the railroads themselves will admit the need of extension is based on the fact that some railroads make plans for new block signaling, but postpone their execution. But this admission of the need is limited to lines with considerable traffic. A true view of the situation is more comprehensive than this. The block system is needed and is economically feasible on lines of both light and heavy traffic. But on lines or branches which do not yield a satisfactory profit railroad companies are usually very reluctant to make even a small expenditure for improving the service, and therefore it behooves the public to see that legislative action is taken.

Railroad Shop Tools.

(*Continued.*)

MUD RING DRILL.

The six-spindle mud-ring drill shown in Fig. 1 is made by the Niles-Bement-Pond Company, New York. The spindles of the machine have independent drive and feed clutches and are adjusted along the cross rail by a rack and pinion. The distance between the housings is 12 ft. 1 in. The minimum distance between the spindles is 8 in. and the maximum distance from the end of the spindles to the table is 14 in. The table has no vertical adjustment, but it has a cross traverse of 2 ft. 2 in., which is adjustable by hand. The countershaft has two sets of pulleys, 24 in. and 30 in. in diameter. These take a 5-in belt and should run at 175 and 225 r.p.m. respectively.

LOCOMOTIVE FRAME DRILLS.

This type of machine is designed for drilling, reaming and tapping the sides and edges

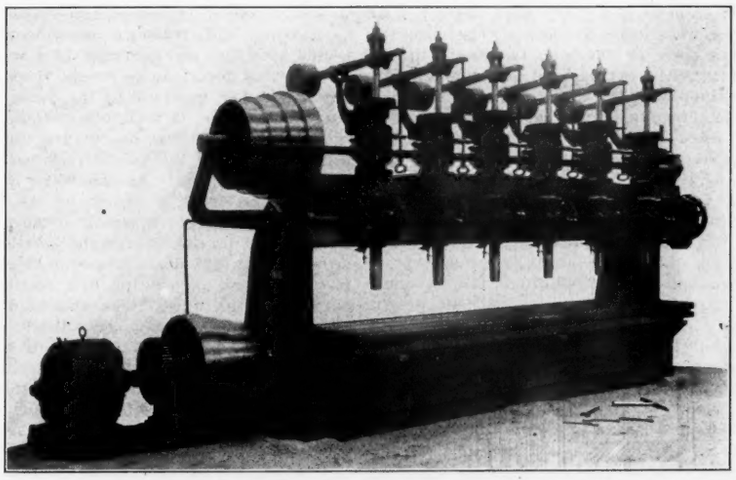


Fig. 1—Niles-Bement-Pond Mud Ring Drill.

of locomotive frames, but may be used to advantage for many other purposes. The machine shown in Fig. 2 is made by the Bickford Drill & Tool Company, Cincinnati, Ohio.

The arms, one of which is made to rotate through an angle of 30 deg., are made of pipe section and are adjustable on the rail, either by hand or by power. The spindles have eight changes of speed, ranging in geometrical progression from 49 to 120 revolutions per minute, and are provided with both hand and power feed, quick advance and return, safety stop, automatic trip, dial depth gage and hand-lever reverse.

The back gears are on the heads, which arrangement brings the power direct to the work, and the gears may be engaged, disengaged or thrown out of service while the machine is running; the operator does not have to reach the shifter in order to stop the spindles. The depth gage, besides enabling the operator to read all depths from zero, supplies a convenient means for setting the automatic trip, the graduation showing where each dog should be set in order to disengage the feed at the desired points.

The automatic trip operates at as many different points as there are depths to be drilled at one setting of the work; in addition it leaves the spindle free, after any intermediate tripping, to be advanced, or raised and advanced, or traversed its full length, without disturbing the setting of dogs; it also throws out the feed when the spindle reaches its limit of movement. There are eight changes of feed, ranging in geometrical progression from .007 to .064 in. per revolution of the spindle. The tapping mechanisms are on the heads and are fitted with friction clutches operated by levers, the handles of which extend around under the arms within convenient reach of the operator. The general dimensions of this machine are as follows:

Diameter of spindles, least section	2⅛ in.
Spindles bored to fit Morse taper	No. 5
Vertical traverse of spindle	17 in.
Max. distance under spindles over table	30 in.
Min. distance from center of spindles on plain arms to face of housings	16 in.
Min. distance from center of spindle on universal arm to face of housings	18 in.
Maximum distance from center of spindles to face of housings	40 in.
Maximum distance between end spindles	27 ft. 4 in.
Traverse of head on plain arms	24 in.
Traverse of head on universal arm	22 in.
Length of rail	29 ft.
Distance from floor to extreme height of spindles	10 ft. 2 in.
Largest diameter of driving cone	24 in.
Width of belt for cone	5 in.
Size of tight and loose pulleys	6¼ in. x 24 in.
Speed of countershaft	450 r.p.m.
Floor space required	7 ft. 4 in. x 33 ft.
Weight, complete	49,000 lbs.

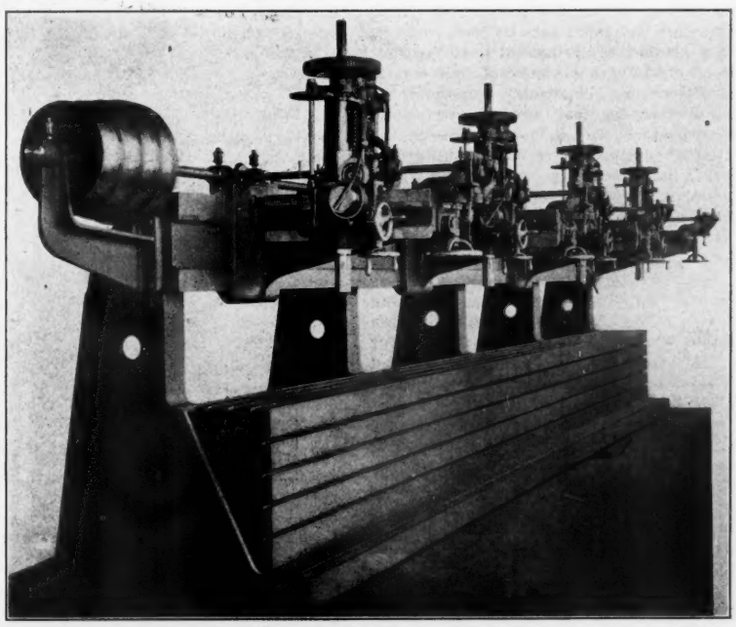


Fig. 2—The Bickford Locomotive Frame Drill.

LOCOMOTIVE FRAME DRILLS.

The locomotive frame drill shown in Fig. 3 is made by Foote, Burt & Company, Cleveland, Ohio. The maximum distance between the outside centers of this tool is 23 ft. 6 in. The length of the table is 24 ft. 6 in., and it has a vertical power adjustment of 2 ft. 6 in. on the uprights. The drill has three heads as shown, the head nearest the driving cone being universal in its motion. The middle head has an in-and-out adjustment of 6 in. and the third head has a vertical adjustment. All of the heads are adjustable along the rail. The heads have three changes of power feed obtained by means of a pull pin. The power feed has a range of 16 in. The machine will drill holes up to 1½ in. in diameter. The width of the face of the cross rail is 14 in. and the width of the face of the column is 8 in. The weight of the machine complete is about 24,000 lbs.

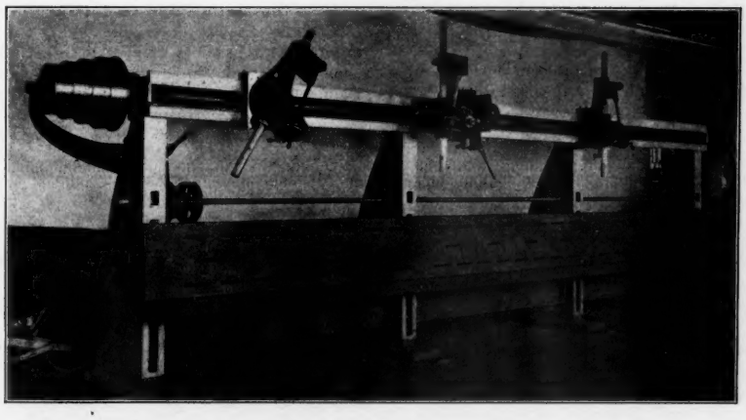


Fig. 3—Foote, Burt & Company's Locomotive Frame Drill.

Creeping Rails.

In a written discussion of Mr. Samuel T. Wagner's paper on this subject presented before the American Society of Civil Engineers Sept. 7 and reprinted almost in full in the *Railroad Gazette*, Sept. 23, Mr. F. S. Stevens, Division Superintendent, Philadelphia & Reading, and a member of the society, mentions one or two remarkable cases which came under his observation. He says:

The term "creeping" should be applied only to those cases in which the rails are moved by external forces; and movement

which is due to expansion and contraction should not be considered. The only force, then, that can produce the trouble is the moving train, and, as the friction or adhesion will hold the rails in place on the ties, it follows that this movement must occur when the rail is not loaded and is practically free from contact with the ties. Therefore, it is due to the wave motion caused by the weight of the train passing over a roadbed which yields more or less to the compression and is somewhat elastic. The movement, then, must precede the train, and will increase directly with the elasticity of the roadbed and the condition of the track as to surface. The writer has had charge of track over ground which, apparently at some time, had been swamp, and the soft alluvial formation, of great depth, carried the embankment of gravel, not exceeding 6 to 8 ft. high; but this comparatively thin layer of gravel was subjected to great vibration under passing trains, and the wave in front of the engine was very perceptible. The result was that frequently the splice-plates were broken at the center, and the rails separated from 6 to 12 in., the splice-plates evidently having cracked some time before, and the joint parted in this way. If there were no cracked plates to part and thus relieve the strain, the bolts were sheared off and the same opening appeared. The strange fact, in connection with the parting of these splices, was that the joints in the track on the hard ground adjoining did not close, but remained open for a distance of half a mile or more from the old swamp, and there the rails ran close together and showed a tendency to buckle. The movement was in the direction of the heavier traffic and up grade.

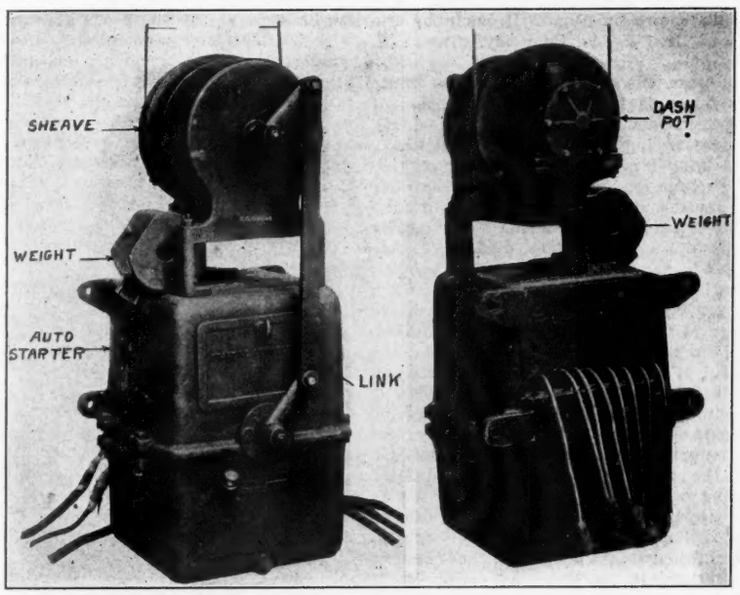
Similar conditions have been found where new ties have been "spotted" in at intervals and have not received proper attention within reasonable time afterward. These, becoming loose, hung by the spikes and gave the rails so little support that violent wave motion was set up and the consequent creeping took place. The effect of loose ties is more noticeable where the tracks are curved, for where the traffic is heavy and slow, and trains are long, and where the track is surfaced for high speed, the load shifts to the low rail and the wheels that travel on the high rail must slip. In addition to the wave motion, there is the dragging effect of the sliding wheels, with the result that the outer rail of the curves creeps and the inner rail does not.

Loose splice-plates also affect the creeping of rails, and, where other conditions are good, loose splices alone will cause some movement. The remedy is to prevent, as far as possible, all wave movement by using rails of sufficient weight to carry the loads without appreciable deflection, build firm and unyielding roadbeds, and use enough good ballast to distribute the load properly and see that it is kept open, so that all water may escape quickly and without saturating and softening the roadbed; then keep all ties tamped to a true and uniform bearing, each tie carrying its proper proportion of the load. The rails in such track will creep very little, and no trouble will be found in keeping the proper expansion allowance at the joints, if the splices are kept uniformly tight.

On the Chicago & Alton rails 133 ft. long are being used, and it is understood that there is no trouble with them. The only question, in this matter of length of rail, is that of handling, and that should not cause much trouble to roads close to their source of supply. The writer does not believe that there has ever yet been any trouble with tracks which could be traced to excessive length of rail, but there has been a great deal of trouble caused by creeping rails which crept because they were neglected, or the ties were loose, the joints were loose, the surface poor, or the men in charge incompetent. When engines and cars ride smoothly, without jolt, jar, sway, or lurch, the rails are not creeping to any great extent. It is poor track which does the creeping, unless the trouble lies below the bottom of the roadbed. Drainage is the "whole thing" in making and maintaining good track which will hold its surface and stay where it is placed, and the cost of maintenance varies, as to rail and labor, very nearly in proportion to the tonnage moved. Eliminate the wave motion by thorough drainage, sufficient weight of rail, good ties, and good surface, with tight joints, and no fear need be entertained on account of trouble caused by creeping rails.

A New Automatic Pump Controller.

The accompanying illustrations show an automatic pump controller designed by the Westinghouse Electric & Manufacturing Company for use with its Type C polyphase motors, from 5 to 50 h.p. capacity. By its use, the pump is automatically started when the water in the tank falls below a predetermined level and is again automatically stopped when the water reaches a certain depth. The actuating power is a single combination of ropes and levers as shown in the accompanying diagram, connected with a float in the tank, and with the starting lever of the device. It is reliable in action, and no constant attendance is necessary.



Front View. *Rear View.*

Westinghouse Float Mechanism for Automatic Pump Controller.

In principle this controller consists of a Westinghouse oil immersed auto-starter, with a starting and stopping mechanism connected by a link and governed by a weighted lever. This lever moves freely through an arc of 138 deg. in a slot in the drum of the automatic device, falling this distance when the action of the float has turned the drum sufficiently to lift the weight just past a perpendicular position. As the water level is lowered, the drum is turned by the falling float and the weight is slowly lifted until it reaches and passes an upright position and falls through 138 deg., throwing the handle to a full running position and starting the pump. As the water rises, the rising float turns the drum in the opposite direction, and the weight is lifted until it falls to its original position, throwing the handle in the opposite direction to the off position and stopping the pump.

In order to secure an even and gradual action of the auto-starter, the impetus of the falling weight is checked by the action of a dash pot, which can be adjusted to regulate the speed of the movement. The weight arm or lever moves loosely upon the shaft, and as it falls it compresses two spiral springs. These are coiled loosely around the shaft and press against a casting which is keyed to the shaft, but which is prevented from turning by a pawl, held by notches in the main casting. The weight arm compresses the springs and then trips the pawl, which the springs move quickly to the next notch. The pawl is tripped three times in the downward movement of the weight. Each time it is tripped, it allows the shaft to be turned a certain distance by the compressed springs, and the auto-starter is thrown through the three notches, starting or stopping the motor.

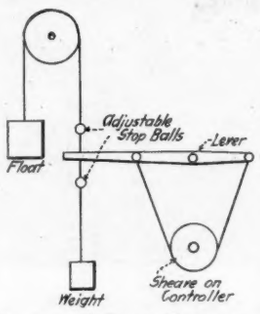


Diagram of Float Mechanism.

The attachment for operating the controller shown in the diagram is designed for use when the controller is placed below the tank. If desired, the controller may be mounted above the tank, a rod attached to the float and passed through the end of the lever replacing the rope illustrated, and the stop balls being attached to this rod. Owing to the many different conditions of installation, and the simplicity of the float mechanism, the Westinghouse Electric & Manufacturing Company does not furnish this portion of the outfit, but simply the controller as illustrated.

GENERAL NEWS SECTION

THE SCRAP HEAP.

On the Pittsburg, Cincinnati, Chicago & St. Louis, the rate of payment for overtime of freight conductors and brakemen has been increased; that of the conductors from 29 cents an hour to 31 cents, and of the brakemen from 19 cents to 20 cents.

Messrs. E. P. Bacon and Frank Berry, accompanied by the Governors of Minnesota and Iowa, called on President Roosevelt last Monday to urge him to ask Congress to empower the Interstate Commerce Commission to regulate freight rates when found to be unreasonable.

On the occasion of the football game at New Haven last Saturday the New York, New Haven & Hartford carried to that city from New York about 15,000 passengers, and from Boston and other points probably an equal number; and all of the trains except two reached destination on time.

With the new time-table to be adopted next Sunday the New York Central will have an additional 24-hour train to Chicago; the Lake Shore Limited, leaving New York at 5.30 p.m., being followed by the "Big Four and Michigan Central Limited," No. 21, starting at 5.32 p.m. The new train will reach St Louis at 9.45 p.m. the next day.

The Lake Shore & Michigan Southern is to discontinue the use of pay cars and will after December 1 pay employees by checks. Mr. Jared H. Hinkley, Chief Paymaster of the road, has held that office 51 years. At the beginning of his term his monthly trips for paying the track repairmen were made on a hand car, as was the general custom at that time.

Philadelphia newspapers say that both the Pennsylvania and the Baltimore & Ohio have again put at work nearly or quite all of the large numbers of laborers in the construction forces who were dismissed last summer when business fell off. Similar reports are made from other roads concerning the re-employment of men who have been laid off, including the New York Central, the Reading and the Rock Island.

When the telegraph and telephone service between New York and Chicago were interrupted for one or two days by the great storm of November 13, one Chicago broker transacted business with the New York Stock Exchange by means of messengers. One left Chicago by the Twentieth Century Limited Monday noon; one left New York for Chicago Tuesday afternoon at 2.45, and another left Chicago Tuesday noon. Another broker tried the telegraph, by way of Yokohama, but found it too slow. A third expedient was to telegraph part way to New York and use the mail the rest of the way.

Officers of the Interborough Rapid Transit Company have laid before the New York Rapid Transit Commission elaborate proposals for four-tracking the Second Avenue Elevated Railroad, for the purpose of providing a road for the running of express trains between the City Hall and the Harlem river. The addition of two tracks to this double-track line would not only make possible the running of express trains, but might perhaps enable the company to run double express trains, down in the morning and up in the evening, using both of the new tracks for trains in the same direction, the trains of empty cars to be returned on the local tracks. This proposal, which is simply the renewal of propositions which have been discussed for a number of years past, is made now, evidently, with the view to providing rapid transit on the east side of Manhattan without going to the expense of building another underground railroad, as has been suggested. The present proposition includes, also, the extension of the express tracks on the Third avenue and the Ninth avenue lines. A principal obstacle to the construction of additional elevated tracks being the prospect of having to pay costly damages to the owners of real estate along the streets, an estimate has been made of the cost of this feature of the proposed improvement, and it is said that it will be about $40,000 for each block of 260 ft., or a total of eight or ten millions for all of the lines now under consideration. This estimate is based on the results of numerous law suits which the Manhattan company has had to settle.

A New Battleship.

The battleship New Jersey was launched on Nov. 10 from the yards of the Fore River Ship & Engine Company, at Quincy, Mass. The New Jersey is 435 ft. long, 76 ft. 2½ in. extreme beam, with a displacement of 15,000 tons and a draft at full load of 26 ft.

Tourist Car Traffic.

WHAT ARE YOUR IDEAS OF TOURIST CARS? If you have the impression that they are "not exactly genteel" you are entirely wrong. Those that the Burlington uses are clean, tidy and comfortable, and the people who travel in them are the same people who traveled in palace sleepers before the tourists were brought up to their present high standard. The sole difference is in the elegance of the furnishings and the cost of berths. Between 60 and 70 per cent. of all travelers to California now use the tourist sleeping cars. They wouldn't do it if the cars were not all right, would they?—*From a C., B. & Q. Advertisement.*

A Large Sized Tip.

The railroad companies are determined to break up the custom among employees of taking money from vagrants for transportation. The hobo detective, with just a few dollars in his pocket, is the bait the railroads are using, and among the first to be caught is a negro porter on the Santa Fe, who was fired at Barstow. He had been approached by a fairly well dressed fellow who wanted to get to Kansas City and struck a deal with the porter, who accepted $15 to see the man through. They got as far as Barstow when the porter received his walking papers, which came so suddenly that it made his head swim. Freight trainmen are also in danger, as the railroads are determined to stop the practice.—*San Bernardino (Cal.) Times-Index.*

Labor Leaders.

It was not a very bad week [Nov. 6-13] for leaders of organized labor. Everyone knows that Debs received some 600,000 votes for President of the United States on the Socialist ticket, and Debs just 10 years ago was serving a prison sentence for a contempt of court committed while managing the great Chicago railroad strikes On Friday evening there was a dinner at the White House, at which one of the special guests was a Mr. Hannahan, at one time a leader in a strike on the Chicago, Burlington & Quincy, that cost the company several millions of dollars to put down. Another guest was Secretary of the Navy Paul Morton, who, as Vice-President of the Burlington, had superintended the job of putting down Mr. Hannahan and his friends. If there are any prominent labor leaders, past or present, who remain Democrats, who are they? Most of them seem to have become Roosevelt Republicans or Socialists. And this is a fact that the leaders of the Democratic party, when they get around to it, could study to advantage perhaps.—*Springfield Republican.* Some of the other persons at the President's dinner were F. P. Sargent, P. H. Morrissey, Warren S. Stone, E. E. Clark and H. R. Fuller. The chief guest was Mr. John Morley, the well-known English publicist.

Locomotive Tests at Schenectady Seventy Years Ago.

Mr. Stuyvesant Fish, President of the Illinois Central, in a letter to Mr. W. J. Wilgus, Fifth Vice-President of the New York Central, expressing his regret at being unable to attend the formal test of the electric locomotive recently turned out by the General Electric Company and American Locomotive Company, called attention to an interesting bit of early railroad history. On Sept. 24, 1831, the Albany & Schenectady Railroad was opened. This was one of the first railroads in the United States and it is fitting that the tests of the electric locomotive which promises to revoluionize railroad transportation should take place near the same spot nearly 75 years later. Mr. Fish quotes from the diary of Mr. Philip Hone as follows:

"Albany, Sept. 24, 1831. Opening of the Albany & Schenectady Railroad.

"After breakfast I joined a large party at the Eagle Tavern, and we proceeded in carriages under the orders of Mr. Cambreling, the Superintendent, to the starting place of the railroad, about two miles from the city. The road from this point is finished a distance of nearly 12½ miles. The inclined planes at each end of the road were unfinished. The whole length of the road when completed will be 15¼ miles. We experienced a detention of nearly two hours, owing to one of the locomotive engines, an English one, being out of order. It was finally abandoned, and we started with an American engine, made at the West Point Works, which performed admirably."

The American engine was built at the West Point Foundry in Putnam County, N. Y.

Seasoning Timber by Soaking.

The Bureau of Forestry of the Agricultural Department at its new experiment stations in Wisconsin and Michigan, will make seasoning tests of cedar and tamarack telegraph poles which have been submerged in water for varying lengths of time. This is an entirely new line of experiment. That immersion in water seems to affect the rate of seasoning has often been noticed. Rafting is said by many lumbermen to improve timber, and logs which have lain for a long time in swamps are in some places eagerly sought for their superiority for certain uses. But just why this should be true, and what practical use can be made of the fact in seasoning generally, are matters which have never been thoroughly ascertained.

It is known that the sap of green wood contains certain soluble substances—albumen, starch, sugars, tannin, etc.—which undoubtedly are leached out of timber immersed in water to a greater or less extent. In ordinary seasoning these substances are left behind as the water evaporates and are deposited on the cell walls. As seasoning begins on the outside these deposits must act as clogs which virtually bottle up to a certain degree the water in the interior. It is possible also that chemical or physical changes in the wood cells are produced by soaking.

Thorough seasoning requires from 18 to 24 months, the time varying with the different kinds of wood. If the Bureau of Forestry realizes its expectations from these new experiments, the time required for seasoning poles will be reduced one-third, and possibly much more. This would prove a valuable economy. If, in addition, the durability of the poles can be increased in this way, the saving both to users of poles and to the cause of forest preservation will be great. Every year added to the service of poles cuts off a proportionate demand upon the forests for their renewal.

Colored Passengers in a Sleeping Car.

Much attention was attracted at the union depot the other day by what appeared to be a plain violation of the Jim Crow laws, a negro man and woman occupying seats in a first class Pullman sleeping car, on one of the trains that left early in the afternoon for the north. Who the people were is not known but they did not even have the redeeming feature of partially white skins. They got on the train here. They applied for tickets on the Pullman and these were sold them without protest on the part of the agents. They bore evidences of respectability, however, and were certainly not of the worst class of negroes. The railroad men said that it was not a violation of law; that the railroad would have been liable to prosecution for damages had it declined to allow them seats. For colored passengers to ride and sleep in the same coaches that are occupied by white people seems to be no uncommon thing of late in this section; it appears to have become more common than formerly.—*Augusta (Ga.) Chronicle.*

Alternating Current Electric Traction.

The Warren & Jamestown Street Railway is equipping an alternating current single-phase electric line between Warren, Pa., and Jamestown, N. Y., for which power will be supplied by gas engines using natural gas. The equipment is now being built by the Westinghouse Companies at East Pittsburg, Pa. The power station will be located at Stoneham, Pa., two miles from Warren. The initial equipment will consist of two Westinghouse gas engines each of 500 b.h.p. capacity. They will be of the horizontal, single-crank, double-acting type, direct connected to two 260 k.w. Westinghouse generators furnishing current to the high tension transmission line. The power equipment also includes a 55 h.p. Westinghouse gas engine for operating an air compressor and an exciter unit. Natural gas, which in this district has a calorific value of about 1,000 b.t.u. per cu. ft., will be used. Five transformer substations will be located along the line. These will receive the high tension current from the transmission line and deliver it at a reduced voltage to the line wire. The cars will be equipped with single-phase motors taking current directly from the trolley wire. Quadruple sets of Westinghouse single-phase motors, each approximately of 50 h.p. capacity, will be supplied for each of the four cars which will be used for the present. An arrangement is provided for operating the alternating-current motors upon the direct-current trolley lines within the city limits at the termini.

Chicago Subway Company.

This company has been granted a charter in New Jersey with an authorized capital of $50,000,000 to control the freight tunnel railroads beneath the streets of Chicago. It is understood that the entire stock of the Illinois Telephone Construction Co. has been acquired, together with two-thirds of the $30,000,000 stock of the Illinois Tunnel Co. The length of freight tunnels completed is said to be 15 miles. This work was described in the *Railroad Gazette* August 7, 1903, and June 24, 1904. James Stillman, E. H. Harriman, Jacob Schiff, John W. Gates and P. A. Valentine are named as being interested in the new company. The formation of the new company by men interested in important Chicago railroads is understood to indicate that friendly relations will be established between these railroads and the subway, thus facilitating connections between freight houses and wholesale stores.

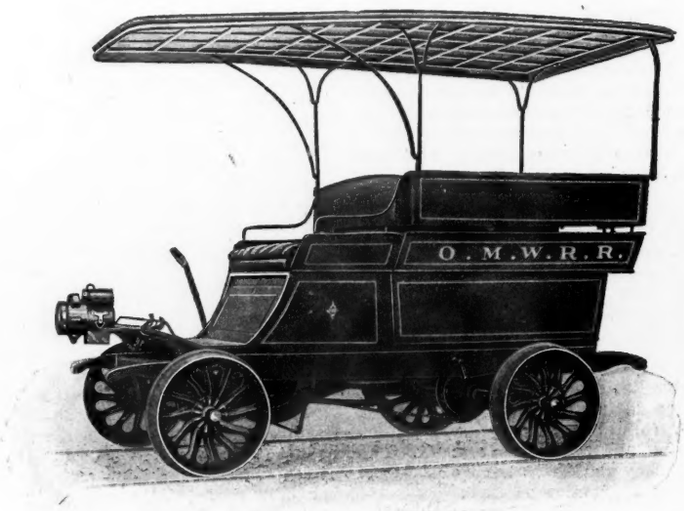
Fires.

The Norfolk & Western coal chutes at Crewe, Va., which cost, with the machinery put in last year, about $35,000, were destroyed by fire November 16.

Pier No. 5 of the Hoosac tunnel docks at Boston, Mass., owned by the Boston & Maine, and which contained a large quantity of freight, was damaged by fire November 17 at a loss of between $400,000 and $500,000. Merchandise valued at $200,000 from the steamer L. P. Holmblad was also destroyed.

Oldsmobile Inspection Car.

A new type of the Oldsmobile railroad inspection car is shown herewith. It is known as the model No. 2 tonneau car, and is similar in general construction to the Oldsmobile inspection car No. 1 with the exception that it has a tonneau added which gives it a capacity of from six to eight persons. This car is designed so that the tonneau can be removed and a platform added which will carry the necessary men, tools and material for ordinary railroad repair work. It is operated by a gasoline motor of 7 h.p. and has a speed of from 30 to 35 miles an hour. The engine and gearing are the same as are used in the regular Oldsmobile runabout automobile and the motor is started by cranking while the car is standing. The car is built for standard gage, has a wheel base of 5 ft. 2 in., oak sills, 20-in. pressed steel wheels, cold-rolled steel axles, Hyatt roller bearings and powerful brakes of the expanding clutch type. These cars have ample capacity for water and gasoline to run the car 100 miles or more and the cost of operating is small. A gallon of gasoline will drive it from 20 to 25 miles. One of these cars has run over 3,000 miles on a railroad where there are grades as high as 3 per cent., and has demonstrated its capacity for running at a satisfactory speed up these grades with a full load. In running the car backward it is geared to run at about one-half the forward speed.



Oldsmobile No. 2 Tonneau Inspection Car.

The Railway Appliances Company, of Chicago, is the sole selling agent for these cars in the United States.

Clear-headed Enginemen.

If it were possible to make engine drivers think of nothing else than their work while on duty, says a division superintendent, the number of accidents would be less. I have always tried to impress upon my runners the absolute necessity of forgetting everything else when they climb aboard their engine. They should have nothing on their minds. If any member of an engineer's family is ill enough for him to worry over it I say: "Don't go out." It's the far better way. Of course it's impossible to know always when a man has something sufficiently important on his mind to divert attention from his engine. But we try. Our engineers have to be fit or they can't run. We are sometimes criticised for trying to regulate the behavior of our engineers when they're

off duty. We do try. There's no use denying it; we have to. It's not a pleasant duty. No man likes to be prying into the affairs of another, but if we have reason to believe one of our engineers is not behaving properly we investigate. The chances are he finds it out and gets indignant. We can't help that. If he doesn't like our methods he can leave.—*Buffalo News.*

Economy in Moderate Train Loads.

The big train load is the right principle of economy in transportation, but the fault has lain too often in the application of the principle. Some train masters have gone so far as to double-head their trains in the direction of light traffic and send back the surplus power light, in the purpose thereby to make a better showing of tons per train. These overloaded trains struggle along, lying in sidings for other trains to pass, disarranging schedules, making over time, consuming fuel, delaying movement and consuming engine and car hire. On the Central Railroad of New Jersey, Vice-President Besler found that trains which were rated for 3,600 tons were occupying on the runs, 18 hours. He issued an order reducing the rating to 2,800 tons and as a result the average time is now 11 hours, 20 minutes, for the same run. His figure of tons per train mile, being honestly computed by charging the entire potential of power used, whether loaded or light, against the traffic which it was used to move, shows an increase in tons per train. Paradoxical as it may seem, in this way he has actually increased his load 36 tons. But the largest results are registered in the expense of conducting transportation. By more care in the movement of his trains on this principle, he has been able to reduce the transportation cost per hundred tons from 40 cents to 32 cents. The Central of New Jersey is one of the few railroads this year which does not have an excessive increase in the expense of conducting transportation. The earnings of this road increased $2,064,796, while conducting transportation expense increased but $86,606.—*Wall Street Journal.*

National Tool Builders' Association.

The third annual convention of this association was held in New York city, on Nov. 15 and 16. One of the questions discussed was "Advancing Prices on an Advancing Market." It was the consensus of opinion that while conditions are undoubtedly on the mend, the time is not yet ripe for an advance in the prices of machine tools; but a resolution was adopted which in substance held that prices of machine tools should be firmly maintained.

There was a proposition to adopt a "uniform selling price for attaching or preparing machine tools for receiving motors," but no decisive action was taken, as it was considered necessary first to arrive at a definite conclusion concerning a standard method of attaching the motors to the tools, in which both the makers of the tools and the motor manufacturers should concur. One prominent lathe manufacturer said that the problem of electric drive was becoming a very serious one; 25 per cent. of the product of his factory was being arranged for electric operation. Belt driven lathes can be manufactured in large lots, but in the case of the electric drive lathes each lathe becomes a special tool. Fred A. Geier, of the Cincinnati Milling Machine Company, read a paper in which he said: "Much of the uncertainty connected with the design of tools suitable for motor driving has been eliminated during the past 12 months, but it will be necessary for us machine tool manufacturers to decide upon a standard speed range for variable speed motors, one that will cover the entire field of machine tool driving. This point settled, we can put the matter before the motor manufacturers, and should have no difficulty in getting them to bring out a line of such motors as a standard for machine tools. From experience we find that we need in the motor a maximum speed of two and one-half times the minimum speed. A motor that would be suited to milling machine driving would have plenty of range for any other machine tool. We require a speed range at the spindle of, let us say, from 25 or 30 to 1. By using a motor with a 2½ to 1 speed variation, and then applying double back gears to the machine, we got this speed range without any difficulty whatever. The method of speed variation of such motors through shunt field rheostat supplies plenty of speeds between the gear speeds. The Ward-Leonard Company supplies these with anywhere from 35 to 120 steps or speeds on small motors. The back gear problem simplifies itself on those machines that require less speed range. The Cincinnati Milling Machine Company has standardized the electric drive arrangement for its milling machines, but every one of the half dozen motors it can use with its arrangement is entirely different in shape and size from any one of the others, and it is necessary to make up special parts to suit the particular motor specified on every order. This prevents the company from standardizing all parts and carrying them in stock."

The next meeting of the association will be held at Washington, D. C. The following officers were re-elected for the coming year: President, William Lodge; First Vice-President, William P. Davis; Second Vice-President, F. E. Reed; Secretary, P. E. Montanus; Treasurer, Enoch Earle.

Manufacturing and Business.

The American Pulley Co., of Philadelphia, will make alterations and additions to its works.

The U. S. Government has bought from Rand Drill Co. 27 Imperial pneumatic hammers and drills, for use in the Manila harbor improvements.

The Davenport Locomotive Works, of Davenport, Iowa, has filed an amendment to its incorporation articles increasing the capital stock from $150,000 to $200,000.

The Hughes Railway Safety Co., of New Orleans, has been incorporated in Louisiana with a capital of $500,000 to make a safety device for railroads. Robert J. Hughes is President and Frank S. Flower Secretary and Treasurer.

The Fulton Foundry & Machine Works, of Atlanta, Ga., maker of castings and special machinery, reports say, is having plans made for new works to include two steel and brick buildings each 120 x 300 ft. to be equipped with electric traveling cranes. W. L. Hancock is General Manager.

Proposals will be received by the Isthmian Canal Commission until November 30 to furnish for use on the Isthmus of Panama three unloading machines, three unloading ploughs and three earth spreaders. Specifications may be had on application to the Secretary of the commission, J. G. Walker. See advertising columns.

The damage done by fire at the works of the Watson-Stillman Co. at Aldine, N. J., recently is nearly repaired, and the company expects to have its full force at work soon. Temporary quarters were furnished by the Pedrick & Ayer Co. so that the more important work was kept up with little or no interruption.

The new Erie Railroad ferryboat Tuxedo, running in New York harbor, is to have the side walls and the deck house built of steel and the upper deck over the passageway for teams lined with steel, with an interlining of asbestos. These improvements are also to be made on the other double-deck boats belonging to the Erie, as safeguards against fire.

The Ajax Manufacturing Company, Cleveland, Ohio, has received the following orders for forging machines: The Cleveland, Cincinnati, Chicago & St. Louis Railway a 4-in. machine; Missouri, Kansas & Texas, 2½-in. machine; Wabash, 2-in. machine; John J. Cummings Car Company, Paris, Ill., 3-in. machine; Springfield Bridge & Iron Works, 2-in. machine.

Bids are wanted December 13 by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for a quantity of machine tools, etc., including lathes, turrets, shapers, planers, locomotive, and dump and flat cars for the navy yards at New York and at League Island Pa. Bids are also wanted on the same date for miscellaneous supplies for the navy yards at Mare Island, Cal., and Puget Sound, Wash. H. T. B. Harris is Paymaster General.

The large car ferry, Detroit, built for the Michigan Central Railroad for use on the Detroit river, was recently launched at the Ecorse yard. The Detroit measures 308 ft. on deck, has 64-ft. beam and is 19½ ft. deep. There will be four independent wheels, two at each end, operated by compound engines, and two double-ended boilers 13 x 22 ft. and two single-ended boilers 13 x 11½ ft. The boat will carry 28 cars and is expected to be put in commission next winter.

Iron and Steel.

The Steel Rail Association will maintain the price of rails at $28 a ton. The advance of $2 a ton in bar iron is made on account of recent advances of from $2 to $3 a ton in scrap iron.

The Empire Bridge Co., of Chemung County, N. Y., it is reported, has received an order to repair a number of steel cars for various railroads, and the work will be done at the south shops of the company.

The improvements being made by the Ensley Steel Works of the Tennessee Coal & Iron Co. will increase the production about 5,000 tons a month, increasing the capacity from 15,000 to 20,000 a month.

Improved conditions in the tin-plate trade, it is said, have caused the American Tin Plate Co. to open a number of idle mills. There will be about 84 tin plate mills in operation by the middle of December, making a total of 199 at work out of 249.

The Lorain Steel Co., reports say, has given a contract to W. J. Ross & Sons, of Johnstown, Pa., for additions to its bolt, shear and truck departments at that place. The buildings will be of brick and iron construction one story high, 165 x 250 ft.

The Steel Billet Association, at a meeting held in Jersey City, November 15, advanced the price of billets $1.50 a ton, to take effect immediately and to apply up to April 1, 1905, making the pool quotations on both Bessemer and open-hearth varieties $21 instead of $19.50 per ton.

Reports from Sharon, Pa., state that the Sharon Steel Hoop Co. will build another

steel hoop mill, doubling the present capacity, and that contracts for the work were to have been given out recently by Morris Bachman, President. New 8 and 9-in. mills will be built, which, it is expected, will be in operation within six months.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

New York and New England Association of Railroad Surgeons.

At the annual meeting of this association in New York city, on Nov. 17, papers were read on "Operation of Special Relief" and "Hospital Departments." Other subjects were also treated and discussed. The following officers were elected: President, Dr. G. P. Conn, of Concord, N. H.; Secretary, Dr. H. D. Dana, of Cortland, N. Y., and Treasurer, Dr. J. K. Stockwell, of Oswego, N. Y.

New York Railway Club.

At the annual meeting of the New York Railway Club, Nov. 18, Dr. Charles E. Lucke, Mechanical Engineer of Columbia University, read a paper on The Regulation of Gas Engines. The annual election of officers resulted as follows: President, H. H. Vreeland, New York City Railway Co.; First Vice-President, J. F. Deems, New York Central; Second Vice-President, W. L. Derr, Chief Engineer, Erie; Third Vice-President, W. G. Besler, Jersey Central. The annual report of Treasurer R. M. Dixon showed receipts $17,102, expenditures $6,489, balance $10,489.

Franklin Institute.

At the stated meeting of the institute November 16 in Philadelphia the programme included a paper on "The Telegraphone," with demonstrations, by Dr. Z. B. Babbitt. This is the invention of Paulson, of Copenhagen, by which the human voice is recorded and stored on a single wire or metal disk without indentation or mark of any kind by electro magnetic means. It may subsequently be reproduced audibly through the telephone and the record may be effaced, permitting the wire to be used over again. At the meeting to be held December 1, the subject to be presented will be "Rolled Steel Car Wheels," by Samuel M. Vauclain, of the Baldwin Locomotive Works.

PERSONAL.

—On Wednesday next, Mr. L. F. Loree will sail for Europe. He expects to be gone several months.

—Mr. A. H. Notman, Assistant General Passenger Agent of the Canadian Pacific, died recently while on his way to his home in Toronto from California. Mr. Notman had been in ill health, and, having been granted leave of absence, had gone to California to recuperate.

—Mr. J. J. Mahoney, General Manager of the Fort Smith & Western, died at Fort Smith, Ark., on November 15, of paralysis. He was a well-known railroad man and was about 55 years old. At one time Mr. Mahoney was General Superintendent of the Winona & Western (Chicago Great Western).

—Colonel Frank J. Hecker, of Detroit, member of the Isthmian Canal Commission, has resigned. Col. Hecker's letter to the President says that life on the Isthmus would endanger his health, but the newspapers say that the resignation is due to the fact that there has been friction among the members of the board.

—Mr. Frank Taylor Hyndman, who on Friday last became General Master Mechanic of the New York, New Haven & Hartford to succeed Mr. Smith, has been in railroad service since the early seventies. A brief sketch and a portrait of Mr. Hyndman appeared in the *Railroad Gazette* at the time of his appointment as Superintendent of Motive Power of the Buffalo, Rochester & Pittsburg. (July 8, p. 27.)

—Mr. Robert L. McKellar, who has been chosen to succeed Mr. McClung as Assistant Freight Traffic Manager of the Southern Railway, was born in Richmond, Ala., 38 years ago. Mr. McKellar has been in railroad service since 1884, when he began as a clerk in the local freight office of the Memphis & Charleston, now a part of the Southern, and he has been successively clerk, freight accountant and general bookkeeper in the auditor's office; soliciting agent and general western agent until 1895, when he was appointed Assistant General Freight Agent. Three years later he was appointed Assistant General Freight Agent at Memphis, from which position he is now promoted as above. In his new position his office will be at Louisville.

—Mr. Charles Wilson, the new Master Mechanic of the Wyoming Division of the Lehigh Valley at Wilkesbarre, Pa., was born in Kilwinning, Scotland, in 1859. Mr. Wilson worked for about five years as machinist

apprentice with James Robertson & Son, and for the five years following he worked at the machinist trade in Glasgow. In 1881 Mr. Wilson came to the United States and worked for a short time at the Eagle Iron Works of Buffalo. He shortly resigned from that company and went to Wilkesbarre and has since been with the Lehigh Valley as machinist, gang foreman, erecting shop foreman and general foreman, from which position he was recently promoted to be Master Mechanic of the Wyoming Division.

—Mr. Thomas Lee McClung, Assistant Freight Traffic Manager of the Southern Railway, has resigned to become Treasurer of Yale College. Mr. McClung is a graduate of Yale, class of 1892, and is the son of Frank H. McClung, of Knoxville. Mr. McClung was born in that city in 1870 and after graduating from the University spent considerable time in traveling. He was for a time paymaster of the St. Paul & Duluth, but has for several years been Assistant Freight Traffic Manager of the Southern.

—Mr. William Howell Masters, Traffic Manager of the Louisiana Western and Morgan's Louisiana & Texas Railroads, died in New Orleans on Wednesday, November 16, at the age of 57. He was a native of Orange County, N. Y., and began his railroad service as an axman on the Poughkeepsie & Eastern. He rose to be engineer and served on several eastern roads; and finally worked as such on the Texas & Pacific. He was General Freight Agent of the Texas & New Orleans in 1877, and then of the Gulf, Colorado & Santa Fe. In 1893, he went to New Orleans as Commissioner of the bureau of freight and transportation. Four years later he left New Orleans and went to St. Louis, where for a time he was Agent of the Southern Pacific, but in 1898 he returned to the south as Assistant Traffic Manager of the Atlantic System of the Southern Pacific.

—Mr. E. N. Armstrong, General Superintendent of the Toledo, Peoria & Western, now promoted to the Presidency, was born in Nashua, N. H., 59 years ago. His first railroad service was on the Illinois Central in 1867, when he began as warehouseman. He was successively (on this and other roads) telegraph operator, train despatcher, superintendent of telegraph and agent. He was for some time on the Indianapolis, Bloomington & Western, and, in 1871, went to Peoria as train despatcher of the Toledo, Peoria & Warsaw. From 1880 to 1882 he was Superintendent of the Iowa Division of the Wabash, St. Louis & Pacific, and in December of latter year he was transferred to the Chicago Division; again in 1883 he was transferred to the Northern Division. The next year he had charge of the Middle Division, from which position he was, in 1885, promoted to be General Superintendent, which position he has held until his election to succeed Mr. Leonard as President.

—Mr. Santford O. Brooks, late General Freight Agent of the Pere Marquette, died recently at his home in Chicago, of heart disease. Mr. Brooks was in the freight department of the Pere Marquette up to a few weeks ago, when he resigned and the position he held was abolished. He was born in Platte County, Mo., in 1849, and was educated at the Methodist school at Plattsburg, Mo. He began his railroad service in 1873 as a clerk on the Hannibal & St. Joseph. In 1876 he was bill clerk at St. Louis on the Missouri Pacific; then for three years on the Union Pacific at Omaha, and subsequently worked for the Southwestern Railway Association, the Western Trunk Line Association, and the Chicago, Rock Island & Pacific. In 1891 he was appointed Assistant Freight Agent of the Chicago, St. Paul & Kansas City, which is now a part of the Chicago Great Western, and in 1898 he was promoted to be General Freight Agent. About two years ago he went to the Pere Marquette.

—H. K. Nichols, formerly and for a number of years Chief Engineer of the Philadelphia & Reading, died on November 22 at the age of 74. Mr. Nichols was born in Pottsville, Pa., and had been in railroad service since 1847.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—George E. Randolph, First Vice-President, has been elected a Director, succeeding the late John K. Cowen.

Buffalo, Rochester & Pittsburg.—Samuel Woolverton has been elected a Director, succeeding Auguste Richard.

Canadian Pacific.—F. Dillinger, having resigned, O. O. Winter has been appointed Superintendent of the First District (Central Division), with headquarters at Fort William, Ont., and J. L. Audrain has been appointed Assistant Superintendent of the Second District, with headquarters at Winnipeg, in charge Winnipeg terminals.

Chicago, Rock Island & Pacific.—The headquarters of W. W. Stevenson, Comptroller, have been removed from Chicago to New York city. Frank Nay, hitherto Assistant

Comptroller, has been appointed General Auditor, with office at Chicago.

Cincinnati, New Orleans & Texas Pacific.—H. B. Hollins, R. H. Govin, Russell Harding and W. J. Murphy have been elected Directors, succeeding H. F. Shoemaker, George M. Cumming, S. M. Felton and Lawrence Maxwell, Jr., resigned.

Colorado & Southern.—Frank Trumbull (President) announces that he has become a partner in the banking and brokerage firm of Peabody, Houghtaling & Company, of New York and Chicago, and that after about December 1 the President's office will be in Chicago.

Joseph P. Cotton, Jr., has been elected a Director, succeeding Adolph Lewisohn, resigned.

Erie.—See New York, Susquehanna & Western.

Evansville & Terre Haute.—F. R. Puder, Engineer of Maintenance of Way, having resigned, F. W. Hawks has been appointed Chief Engineer of this company and the Evansville & Indianapolis Belt Ry., with headquarters at Evansville, Ind.

Illinois Central.—H. J. Schening, hitherto Trainmaster, has been appointed Assistant Superintendent at Evansville, Ind. (See Missouri Pacific.)

Kansas City.—D. G. Boissevain has been elected a Director, succeeding Lawrence Greer.

Mexican Central.—C. Stich has been appointed Superintendent, succeeding C. W. Scott, resigned.

Missouri Pacific.—W. H. V. Rosing, hitherto Assistant Superintendent of Machinery of the Illinois Central, has been appointed Mechanical Engineer of the M. P., with headquarters at St. Louis.

New York, New Haven & Hartford.—T. E. Byrnes has been appointed Assistant to the President, with office in Boston. Mr. Byrnes will represent the President in all matters requiring his attention and in all such matters will act with the full authority of the President.

The headquarters of F. S. Curtis, Second Vice-President, have been removed from Boston to New Haven.

New York, Susquehanna & Western.—C. C. Riley, Superintendent of Transportation of the Erie, is also Superintendent of Transportation of the N. Y., S. & W., succeeding the late A. M. Mozier.

Queen Anne's.—John C. Bosley, General Freight and Passenger Agent, will (temporarily) assume the duties formerly discharged by W. H. Crumpton, General Manager. The office of General Manager has been abolished.

St. Louis, Brownsville & Mexico.—B. F. Yoakum has been elected President, succeeding Uriah Lott.

Toledo, Peoria & Western.—E. N. Armstrong, hitherto General Superintendent, has been elected President, succeeding E. F. Leonard, resigned. E. D. Usner has been appointed Treasurer, and F. L. Fox succeeds Mr. Usner as Auditor.

Vera Cruz & Pacific.—T. Purcell has been appointed Superintendent.

LOCOMOTIVE BUILDING.

The Boston & Maine has ordered 28 locomotives from the American Locomotive Co.

The Chicago & Eastern Illinois has ordered 12 locomotives from the Baldwin Locomotive Works.

The Cincinnati, Hamilton & Dayton has ordered 40 locomotives from the American Locomotive Co.

The Delaware, Lackawanna & Western has ordered 32 locomotives from the American Locomotive Co.

The Sligo & Eastern (S. L. & S. F.) is having one simple Mogul (2-6-0) locomotive built by the Davenport Locomotive Works. This locomotive will weigh 103,000 lbs., with 92,000 lbs. on drivers. Special equipment includes: Pyle-National electric headlights, Leach sanding devices, American-Westinghouse air-brakes, Monitor injectors, Nathan sight-feed lubricators, Janney couplers and cast-steel wheel centers. The tender will be built entirely of steel, with American Steel Foundries' bolsters and Davis counterbalance wheels.

CAR BUILDING.

The Wisconsin Central has ordered 700 box cars from Haskell & Barker.

The Cornwall & Lebanon is having 50 freight cars built by the Cambria Steel Co.

The Philadelphia & Reading is reported about to let an order for 1,000 freight cars.

The Southern Pacific is reported to be building 4 mail cars at its Sacramento shops.

The Grand Trunk has ordered 1,000 box cars from the Western Steel Car & Foundry Co.

The Guffey Petroleum Company is having 30 freight cars built by the Standard Steel Car Co.

The Atlantic & North Carolina has ordered 50 box cars from the South Baltimore Steel Car & Foundry Co.

The Chicago, Burlington & Quincy is reported to have ordered 1,000 additional box cars from the Pullman Co.

The Cambria Coal Company is having 100 freight cars built at the McKees Rocks Works of the Pressed Steel Car Co.

The Illinois Central has ordered 500 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co.

The Central of New Jersey has ordered 1,000 hopper gondolas of 80,000 lbs. capacity from the Standard Steel Car Co.

The Chicago, Burlington & Quincy has ordered 200 Ingoldsby automatic dump cars from the Ingoldsby Automatic Car Co.

The German-American Car Lines are reported to have ordered 4,000 refrigerator cars from the American Car & Foundry Co.

The Cleveland, Cincinnati, Chicago & St. Louis is having 50 freight cars built at the Detroit Works of the American Car & Foundry Co.

The Chicago, Rock Island & Pacific is reported to have ordered 300 Ingoldsby automatic dump cars from the Ingoldsby Automatic Car Co.

The Chicago, Rock Island & Pacific has ordered two postal cars from the Pullman Co., in addition to the three cars reported in our issue of November 11.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 200 freight cars from the American Car & Foundry Company in addition to the 500 box cars recently ordered.

The Philadelphia & Reading has ordered 30 standard passenger coaches with open platforms, 15 standard vestibule coaches, five combination vestibule coaches, 13 standard baggage cars and two baggage cars with special doors from Harlan & Hollingsworth.

The Chicago & Eastern Illinois, as reported in our issue of November 18, has ordered 550 gondolas of 100,000 lbs. capacity from the American Car & Foundry Co. for January, 1905, delivery. These cars will weigh 37,000 lbs., and will be 40 ft. long, 9 ft. 3½ in. wide and 4 ft. high, all inside measurement. Special equipment includes: Simplex bolsters and brake-beams, Miner draft rigging, McCord journal boxes and journal box lids, Chicago couplers, and American Car & Foundry Co.'s wheels.

The Southern, as reported in our issue of November 11, is having six postal cars and three newspaper cars built by the American Car & Foundry Co. These cars will be 61 ft. long, 9 ft. 10⅛ in. wide and 14 ft. 2 in. high, with wooden frames and underframes. Special equipment includes: Open-hearth steel axles, Waycott brake-beams, Corning brake-shoes, Westinghouse high-speed brakes, Ajax brasses, Janney-Buhoup couplers, McCord journal boxes and journal box lids, Pintsch gas, Standard Steel Co.'s platforms, McKee-Fuller Co.'s wheels and Buhoup short vestibules.

BRIDGE BUILDING.

ALBANY, N. Y.—Bids will be asked early next month by C. S. Boyd, State Superintendent of Public Works, for building a bridge 18 ft. wide and 290 ft. long to cost about $20,000 over Seneca River between Lysander and Coal Spring.

CANTON, KY.—The question of building a free bridge over the Cumberland River in Trigg County, to cost about $25,000, is being agitated.

CHICAGO, ILL.—Bids are wanted December 2 by F. W. Blocki, Commissioner of Public Works, for building the superstructure of the Archer avenue bridge.

CLINTON, KY.—Hickman County will build four bridges this year. E. B. Samuel is County Clerk.

CLEVELAND, WIS.—A bridge is proposed between this place and Arthur over the Chippewa River to cost about $10,000.

COTESFIELD, NEB.—A vote has been passed to issue bonds for building a bridge over the North Loup River.

COVINGTON, LA.—The Police Jury, it is reported, has decided to ask bids for building an iron bridge over the Bogue Falaya River at this place to have a roadway of 16 ft. Bids will also be asked for the removal of the present iron bridge.

ELMIRA, N. Y.—The Common Council has passed a resolution closing the Lake street bridge. Action will soon be taken on the question of making repairs to the present structure at $16,000 or building a new bridge to cost $40,000.

FRANKLIN, PA.—The Lake Shore & Michigan Southern is to build a new bridge at the mouth of the French River to replace the present structure.

GREENSBURG, PA.—Bids will be opened December 29 by County Controller John H. Brown for building a three-span steel bridge 256 ft. long with an 18-ft. roadway over Loyalhanna Creek near Latrobe.

HARRISBURG, PA.—An ordinance has been introduced authorizing the issuance of bonds for $200,000, the proceeds of which are to be used for building a new bridge to replace the present Mulberry street viaduct.

IOWA CITY, IOWA.—The State University of Iowa, according to local reports, is making surveys for a large bridge to be built over the Iowa River at Scales Bend, to consist of two spans of 135 ft. each.

LONDON, ONT.—The Southwest Traction Co. will build several steel bridges on the line of its road between this city and St. Thomas.

MANISTEE, MICH.—It has been voted to issue $30,000 of bonds to build a swing or roller lift bridge over the Manistee River at this place.

NEW BEDFORD, MASS.—A hearing will be given December 3 in New Bedford to apportion the cost of a bridge to be built at Fairhaven. James R. Dunbar is Chairman of the Commission.

NEW CASTLE, PA.—A bridge is proposed over the Neshannock Creek to connect Cunningham and Water streets.

NEW YORK, N. Y.—The ordinance recently adopted by the Board of Estimate authorizing an appropriation of $600,000 for the Blackwell's Island bridge has been approved by the Mayor. The Board of Aldermen refused to take any action, but it became operative through the expiration of the time limit.

The Board of Aldermen, on November 15, appropriated $125,000 for building bridges at

Hamilton avenue, Third street, Ninth street and Union street over Gowanus Canal, in the borough of Brooklyn.

Commissioner Best is quoted as saying that he is satisfied with the original contract for the Blackwell's Island bridge, which calls for an immediate expenditure of $685,000, and that no action will be taken, as suggested by the Merchants' Association, towards giving out new contracts.

PASSAIC, N. J.—The Bergen County Freeholders have closed the temporary bridge over the Passaic River. At a special meeting of the County Board, November 14, a proposition was received from the Public Service Corporation offering to pay $10,000 towards building a new bridge if permitted to place two tracks on it.

PHILADELPHIA, PA.—The bids opened by Director of Public Works Peter E. Costello, November 15, were as follows: For the Allegheny avenue bridge, towards which the city pays three-fourths and the Pennsylvania Railroad the balance, Henderson & Co., $96,773; Hoffman Engineering & Construction Co. $99,500; Miller & McGraw, $105,700; M. J. Hogan & Co., $108,393; J. H. Loucheim, $108,900; Sparks & Evans, $114,959; Smith Construction Co., $116,252; David Peoples, $117,900, and Riley & Webber, $121,900. For the bridge on the line of Graver's lane, the cost to be borne jointly by the city and the Reading Railway, contract awarded to John McMenamy at $14,000; other bids were Henderson & Co., $15,137; Richard P. Bennis, $15,500; J. H. Loucheim, $16,400; Enos L. Seeds, $16,800; McCormick & Co., $17,332; Riley & Webber, $17,867; F. J. Boaz, $19,300; M. J. Hogan, $19,581; Daniel J. McNichol, $20,325, and Street F. Harlon, $23,776. For the bridge on the line of Hunting Park avenue, the cost to be borne by the city, Philadelphia & Reading and the Philadelphia Rapid Transit Co., contract awarded to D. J. McNichol at $43,554; other bids were John McMenamy, $45,000; Henderson & Co., $46,367; McCormick & Co., $47,647; Miller & McGraw, $49,763; M. J. Hogan & Co., $49,763, and J. H. Loucheim, $51,000. For the bridge on the line of the Torresdale boulevard, for which the sum of $37,000 has been appropriated, contract awarded to D. J. McNichol at $32,500; other bids were John McMenamy, $34,365; Davie Peoples, $42,000; J. H. Loucheim, $42,000; Miller & McGraw, $47,658, and M. J. Hogan & Co., $47,990.

PORTSMOUTH, OHIO.—The City Council, it is reported, has taken action towards building a bridge over Lawson run.

POTTSVILLE, PA.—A county bridge is to be built in Washington township.

SCRANTON, PA.—The Grand Jury has under consideration petitions requesting the building of bridges over Aylesworth Creek and over Rushbrook, in Mayfield Borough, and over the Lehigh River in Clifton Township.

TIVERTON, R. I.—The report of the commission appointed for building a new bridge on the site of the present Rhode stone bridge recommends the construction of a new bridge and asks that an appropriation of $170,000 be made for the work, $5,000 to be spent this year.

TOPEKA, KAN.—A vote has been passed to issue bonds for rebuilding the Melan bridge over Kansas River; also for five other bridges.

The Board of County Commissioners will ask for bids probably January 1 for rebuilding the Sardou avenue bridge.

TRENTON, N. J.—At a recent meeting of the Board of Freeholders it was decided to appoint a committee to arrange for bids for building the railroad bridge at Chamber street. Frank Eppelle is County Engineer.

WILKESBARRE, PA.—It has been conditionally decided to build two bridges, one of which is to be a highway bridge over the tracks between North Wilkesbarre and the east end estimated to cost $80,000. The other is to be a foot bridge to be built over the tracks of the Lehigh Valley and Central railroad tracks on East Market street on the railroad property.

Other Structures.

BALTIMORE, MD.—The Baltimore & Ohio, local reports state, has announced that it will build a 14-story office building at the northwest corner of Baltimore and Charles streets to cost about $1,500,000.

CINCINNATI, OHIO.—The Chesapeake & Ohio will soon begin work on terminal improvements, to include a new freight house at Third street, where the company has a site 1,000 ft. long and 100 ft. wide, and an additional freight house at Fifth avenue.

COLUMBUS, OHIO.—The Baltimore & Ohio, it is reported, has commenced work on its new freight station, to be built at the corner of Naghton and Third streets at a cost of about $200,000.

FORT WAYNE, IND.—The Fort Wayne & Southwestern and the Wabash Valley electric roads, according to reports, will jointly build a new power station to cost about $1,000,000.

JOPLIN, MO.—A local company, it is reported, has been organized to build a union passenger station here. H. R. Conklin represents the company.

JACKSON, OHIO.—The Detroit Southern, it is reported, has decided to build its new shops here, the city having offered a site of 20 acres of ground and $20,000 in cash to secure the shops.

LOGANSPORT, IND.—All the street railways, it is reported, will jointly build a terminal station to cost about $50,000.

PRINCETON, IND.—The Southern, it is reported, will double the capacity of its shops at this place. Plans are being made to build a large foundry and an additional large machine shop. It is also stated that the machinery from Youngstown and other small shops along the Louisville division will be removed to this place, where most of the repairing and building of the system will be done. Work is to be commenced early in December.

ROANOKE, VA.—The Norfolk & Western, local reports state, is asking bids for a new machine shop to be built in the west end of the city.

SAN FRANCISCO, CAL.—The United Railroads of this place, it is reported, have decided to build shops in which to make cars and equipment.

SAVANNAH, GA.—The Seaboard Air Line warehouses on River street were damaged by fire November 12, loss about $30,000.

SHEBOYGAN, WIS.—Plans for the Chicago & North Western's new passenger station, it is reported, are completed; also for a large freight house.

TERRE HAUTE, IND.—Improvements, it is reported, are to be made at the Vandalia shops. Repairs will be made and large additions added; also a new large roundhouse to have 40 stalls. The total cost of the improvements is to be about $500,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATLANTIC COAST LINE.—A contract has been let by this company to William T. Cotter, Jacksonville, Fla., for the work in connection with its proposed terminal at Jacksonville. The improvement includes a wharf 2,180 ft. long and large trackage additions to the present terminal yard at this point. (September 30, p. 110.)

BIG CREEK & THUNDER MOUNTAIN.—This company has been organized in Idaho to build a railroad from Lardo east to Roosevelt, 60 miles. The line will be used for logging. The headquarters of the company will be located at Lardo, Idaho.

CHERRY VALLEY.—Incorporation has been granted this company in Ohio with an authorized capital of $100,000. The headquarters of the road will be at Leetonia, Ohio. E. M. Peters, H. G. Forsythe, W. G. Lodge, M. A. Taylor and A. J. Sevenich are named as incorporators.

CHESAPEAKE & OHIO.—An officer writes that the Big Sandy extension, from Whitehouse, Ky., to Elkhorn City, 77 miles, will be put in operation as far as Prestonburg, 23 miles, before the end of the month. It is expected to have the line ready for operation to Elkhorn City by June, 1905. The maximum grade is .2 per cent. and the maximum curvature 8 degrees. There will be eleven steel bridges and one tunnel 400 ft. long. Langhorne, Johnson & Co., of Richmond, Va., are the contractors. The work is being carried on under the supervision of F. I. Cabell, Engineer of Construction. (September 16, p. 94.)

COLORADO, WYOMING & IDAHO.—Articles of incorporation have been filed by this company in Wyoming. It is proposed to build a railroad from Denver, Colo., northwest to Laramie, Wyo., 90 miles. W. R. West, Laramie, Wyo.; John D. Milliken, McPherson, Kan., and others are named as incorporators.

COLUMBUS, MARSHALL & NORTHEASTERN.—Press reports state that work is about to be resumed on this proposed road from Marshall, Mich., to Olivet, 40 miles. Grading was completed between these two points in 1902, but the work was then stopped owing to lack of funds. H. E. Hollon, Marshall, Mich., is President. (See Construction Supplement.)

DENVER, WICHITA & MEMPHIS.—This company, which was recently chartered in Oklahoma Territory, proposes to build a railroad from Denver east through Colorado, Kansas, Oklahoma and Indian territories to Memphis, Tenn., about 2,000 miles. The headquarters of the company will be at Oklahoma City. F. W. Casner and M. Harrington, Kansas City, Mo., are among the incorporators. (November 18, p. 161.)

HELM & NORTHWESTERN.—Application has been made by this company for a charter to build a railroad from Helm, in Washington County, Miss., northwest to Arnold, in Bolivar County, 20 miles. Connection will be made with the Yazoo & Mississippi Valley at both points, and it is believed that the company is being incorporated in the interest of the Yazoo & Mississipi Valley. J. W. Cashin, G. B. Rucks and others, of Greenville, Miss., are incorporators.

INDIANAPOLIS & MARTINSVILLE (ELECTRIC).—It has been announced that work will be begun on an extension of this electric railroad from Martinsville, Ind., to Bloomington, 24 miles, early in the spring. Rights of way have been secured and location surveys completed. The headquarters of the company are at Indianapolis.

JACKSONVILLE & SOUTHWESTERN (ATLANTIC COAST LINE).—A contract is reported let to Wade & McNair, Jacksonville, Fla., for building an extension from Newberry, Fla., through Fort Fannin to Perry, 52 miles. Surveys for this line have been completed, and it is stated that work will be begun in a short time. The new extension will open extensive lumber tracts in Florida, and will give the Atlantic Coast Line a direct connection with deep water at Jacksonville. (September 23, p. 103.)

JASPER & EASTERN.—A charter has been granted this company in Texas for the purpose of extending the Gulf, Beaumont & Kansas City division of the A., T. & S. F. from Kirbyville, Tex., northeast to Alexandria, La., 83 miles. Branch lines will also be built out of Alexandria to Carson, La., six miles; to Bon Ami, three miles, to Vernon, six miles, and to Leesville, 15 miles. T. P. Jones, O. L. Clark, J. W. Terry, F. G. Pettibone, T. J. Lee, J. F. Baxter, all of Galveston, Tex., and E. P. Ripley, President of the Santa Fe, are incorporators.

JEFFERSON & ATHENS.—A charter has been granted this company in Georgia with an authorized capital of $50,000. It is proposed to build from Jefferson, Ga., southeast to Athens, 15 miles. Preliminary surveys are now in progress. F. L. Pendergrass, Jeffer-

son, Ga., is said to be interested. (September 30, p. 111.)

KANSAS CITY, MEXICO & ORIENT.—A contract has been let to Edwards & Luttgerding for building 52 miles of this road from El Dorado in a northeasterly direction towards Wichita, Kan. Work will be begun on this portion of the line at once. (May 13, p. 376.)

KANSAS CITY, TULSA & SOUTHWESTERN.—Surveys have been completed for this proposed road from Talala, Ind. T., southwest to Wichita Falls, Tex., 250 miles. Connection will be made with the St. Louis, Iron Mountain & Southern at Talala and with the Oklahoma division of the M., K. & T. at Tulsa. Jay Forsythe, Tulsa, Ind. T., is President; C. W. Brown, Vice-President; W. H. Hendren, General Manager and Chief Engineer, and C. B. Lynch, Secretary. (July 22, p. 41.)

KNOXVILLE, LA FOLLETTE & JELLICO.—The Cow Creek branch running from Dossett, Tenn., to Oliver Springs, 12 miles, is reported completed, and it is stated that the line will be opened for traffic before the end of the year. (October 28, p. 139.)

LIVE OAK & PERRY.—It is reported that this road, which runs from Live Oak, Fla., southwest 22 miles to a point in Lafayette County, will soon be extended 45 miles farther to Perry, in Taylor County, and thence to the mouth of the Aucilla River. Thomas Darling, Live Oak, is President. (See Construction Supplement.)

LONG ISLAND.—This company has filed a petition with the Borough President of Queens asking for the closing of three streets near its Bay Ridge terminal. This is said to be the preliminary step towards enlarging its terminal at this point at a cost of about $750,000.

LOUISIANA & ARKANSAS.—Fisk & Robinson, 15 Cedar street, New York, have issued a well written and attractively illustrated book describing this road and its prospects. The present company was organized in June, 1902, to take over the assets of the Louisiana & Arkansas Railroad operating a line 125 miles long between Stamps, Ark., and Winnfield, La. Under the present management, the northern extension from Stamps to Hope, 22½ miles, has been completed, and the southern extension from Winnfield, La., to Jena, 39½ miles, has also been finished, making a total length of 187.2 miles. As the line from Winnfield to Jena is not yet open for traffic, the mileage worked is 147.7 miles. Two extensions are projected; one from Jena east to Natchez, Miss., 47 miles, and the other from Packton, Iowa, south to Alexandria, 36 miles. When these are completed, the line will form part of a through route from the Central West to New Orlaens. The country through which this road runs is in part a farming country and partly short leaf pine timber. The line connects at Hope, its northern terminus, with St. Louis, Iron Mountain & Southern, and at Stamps with the St. Louis Southwestern. It also crosses at Sibley the Vicksburg, Shreveport & Pacific. About 60 per cent. of the total road is laid with 75-lb. rails. The maximum grade is 1½ per cent. and the maximum curvature 4 degrees. The equipment of the company consists of 24 locomotives, 10 passenger cars and 806 freight cars. The third annual report for the year ending June 30, 1904, shows gross earnings of $704,671, as compared with $532,534 in 1903. Operating expenses were $487,795, as against $371,706 in 1903, leaving net earnings of $216,876, or an increase of $56,048. After payment of fixed charges and taxes, the surplus for the year was $115,457.

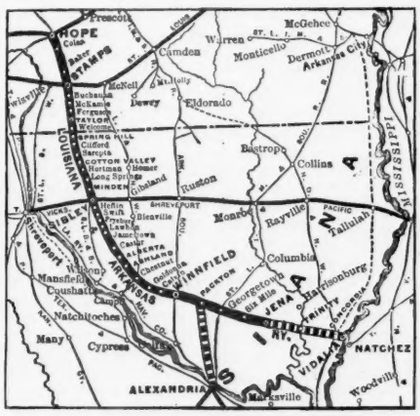
MEXICAN CENTRAL.—An official is quoted as saying that work will be resumed on the extension from Tuxpan to Colima early in 1905. Connection will be made at the latter point with the road which runs between Colima and Manzanillo. (August 21, p. 123.)

MINTER CITY, SOUTHERN & WESTERN.—Application is being made for a charter for this company to build a railroad from Minter City, in Leflore County, Miss., west to Dockery, 18 miles. J. B. Kemp, G. B. McCob and E. R. Toombs, all of Greenville, Miss., are named as incorporators.

MISSISSIPPI & EASTERN.—It is reported that this road will extend its line from Quitman, Miss., southeast to Jackson, Ala., 140 miles. The line has recently been completed from Quitman as far as Melvin, 20 miles, and the remaining portion is under survey. It is expected that the company will let contracts for the remainder of this line in January. Perley Lowe, Chicago, Ill., is President, and J. W. Glynn, Quitman, Miss., is Chief Engineer. (April 22, p. 314.)

MOBILE & WEST ALABAMA.—The newspapers say that work will soon be begun on this proposed road from Mobile, Ala., to Florence. Location surveys have been completed between the two points. The maximum grade will be one per cent. northbound and .6 per cent. southbound. J. A. Montgomery, First National Bank Building, Birmingham, Ala., is Second Vice-President and Chief Engineer. It is reported that the line will be built by the Terry & Gahagan Construction Co., 79 Wall street, New York.

NEW YORK CENTRAL & HUDSON RIVER.—Answering inquiries of reporters, President Newman says: "The New York Central now has engineers in the field, making a thorough investigation of the country between Chatham and Springfield on the north and some point in the vicinity of Brewsters or Golden's Bridge, on the Harlem division, on the south. While the surveys may show that a line connecting with the Boston & Albany at some point between Chatham and Springfield will not be practicable, owing to the difficulties of finding an easy grade line through that section, the fullest investigation of this will be made; the question of whether it shall be built will be considered and determined. The double tracking of the Harlem division is now finished to Golden's Bridge It is the purpose of the company to extend the double tracking of that division, changing its alignments where necessary, so as ultimately to get another double track line between New York and Albany by use of a part of the Boston & Albany. From Brewsters, N. Y., to Westfield, Mass., the air-line distance is about 70 miles; but an air-line railroad is practically impossible."



Louisiana & Arkansas.

PEACH RIVER & GULF.—An officer writes that a length of 15 miles of this road, which was recently chartered, is already in operation; it is from Timber, Tex., to Midline. It is proposed to eventually extend the line to Beaumont. R. W. Luttrell, Galveston, Tex., is Chief Engineer. (November 11, p. 154.)

PITTSBURG, BESSEMER & LAKE ERIE.—A preliminary survey has been completed and rights of way secured for a line from Butler, Pa., to New Castle, 30 miles.

PITTSBURG, CINCINNATI, CHICAGO & ST. LOUIS.—It is reported that this company has decided to lay a second track from Indianapolis to Richmond, 68 miles, and between Florence and Xenia, 24 miles. Bids for this work will be called for in a short time by W. C. Cushing, Chief Engineer of Maintenance.

SAN DIEGO EASTERN.—Press reports state that work will soon be begun on this proposed road from San Diego, Cal., to Yuma, Ariz., 225 miles. Rights of way are now being secured. C. W. French, San Diego, may be addressed. (March 18, p. 222.)

SILVERTON R. R.—Articles of incorporation have been filed by this company in Colorado. It is probable that this new company has been formed to take over the present road of the same name which is now in the hands of a receiver. The headquarters will be at Denver. Alexander Anderson, Silverton, Colo.; J. A. Ewing, Leadville, Colo.; Otto Meers, Denver, and others are named as incorporators.

SUMTER & NORTHERN.—This company has been chartered in South Carolina to build a railroad from Sumter north through Lee, Darlington and Chesterfield counties to McBee, 40 miles, where connection will be made with the Seaboard Air Line. R. E. Carnes, W. R. Scarborough and J. E. Stucky, all of Sumter, S. C., are incorporators.

TEMISKAMING & NORTHERN ONTARIO.—Work is progressing rapidly on this road from New Liskeard, Ont., in a northerly direction for a distance of 100 miles. Track has been laid for about seven miles and grading for about 25 miles. W. B. Russell is Chief Engineer. (June 17, p. 8.)

TEXAS ROADS.—A correspondent in Texas writes to say that the railroad commissioners of Texas are not so black as they are painted. He says: "Reports of railroad building recently published in the newspapers of Texas would seem to indicate that the State Railroad Commission is not such a hard taskmaster as some of its enemies have tried to make out. Instead of all the railroads in Texas being on the verge of bankruptcy because of the severe regulations laid down by the 'tyrant' railroad commission, they appear to be about to enter an era of new construction and prosperity. For the past two years, there has been a lull in railroad building in the State, but this inactivity seems to have now been broken. Plans are reported under way for an extension of the Jacksboro branch of the C., R. I. & P. northwest through the panhandle of Texas to a connection with the Choctaw division at Amarillo, a distance of 275 miles. It is also stated that the Choctaw division is soon to be extended from Amarillo to Tecumcari, 110 miles. The St. Louis, Brownsville & Mexico, now in operation between Robstown, Tex., and Brownsville, 142 miles, is being extended from Robstown to Bay City, 150 miles. Grading is in progress on this extension and it will probably be finished early in 1905. It is announced that the Fort Worth & Rio Grande division of the St. Louis & San Francisco will soon be extended south from Brady to San Antonio, 135 miles. The Jasper & Eastern has been organized for the purpose of extending the Gulf, Beaumont & Kansas City division of the Santa Fe from Kirbyville, Tex., to Alexandria, La. This proposed line will have some 17 miles in Texas. Surveys have been practically finished for building a railroad from a point on Pecos Valley line near Canyon City to San Antonio. C. L. Tallmadge, of Chicago, is interested in this road. Another railroad on which work has commenced is the Colorado, Texas & Mexico. This is to run from Abilene to Llano, 135 miles. About 150 miles of the Kansas City, Mexico & Orient between Sweetwater, Tex., and the Red river on the northern boundary of the State are now being built. An extension of the Trinity & Brazos Valley from Mexia southeast to Beaumont is under consideration. Building is in progress on the Texas & Gulf from Timpson to Sabine Pass, 150 miles. The Nacogdoches & Southeastern is building a line from Nacogdoches to San Augustine, 28 miles. The Orange & Northwestern, which runs from Orange to Buna, Tex., 30 miles, is soon to be extended north to Dallas. If only half of this proposed mileage is built, it will still give the State several thousand miles of new track, and it would seem that the people of the State are in a hopeful frame of mind."

Wabash & Rochester (Electric).—Press reports state that this proposed electric railroad from Wabash, Ind., to Rochester, 36 miles, has been about half graded, and that track laying on this graded portion will be begun at once. W. H. Wiley, Wabash, Ind., is in charge of the work. (See Construction Supplement.)

RAILROAD CORPORATION NEWS.

Boston & Maine.—The $500,000 20-year 3½ per cent. bonds recently issued to refund a similar amount of 4 per cent. bonds due on February 1, 1905, have been awarded to N. W. Harris & Co., New York, and Merrill, Oldham & Co., Boston, jointly at 98.67.

Chicago, Rock Island & Pacific.—Speyer & Co. announce that the entire block of $25,000,000 first and refunding 4 per cent. gold bonds recently sold to them by this company have been disposed of in Europe and among a number of savings banks in New York and Connecticut. The proceeds from the sale of these bonds will be used to reimburse the treasury for capital expenditures already made and to pay for obligations maturing in 1905.

Cincinnati, Hamilton & Dayton.—This company has sold to Redmond & Co., New York, $6,000,000 Pere Marquette refunding-mortgage 50-year 4 per cent. bonds which it held in its treasury. The bonds are part of an authorized issue of $60,000,000 secured by a lien on the entire Pere Marquette system, and guaranteed principal and interest by the C., H. & D. The proceeds from the sale are to be used for new equipment and improvements.

Cleveland, Lorain & Wheeling.—The annual report of this company for the fiscal year ending June 30, 1904, shows gross receipts of $2,839,776, as compared with $3,159,023 in 1903; and net earnings amounted to only $537,097, as compared with $1,128,415 in 1903. The surplus for the year was the smallest shown for some time, being only $114,889, as compared with a surplus of $696,540 in 1903, $752,000 in 1902 and $310,470 in 1901. The surplus for the year is equivalent to about 2.3 on the outstanding preferred stock.

Cleveland & Pittsburg.—This company has delivered to the Pennsylvania Railroad in payment for betterments and improvements 80,000 shares of 4 per cent. special guaranteed betterment stock of the par value of $50 per share, carrying quarterly dividend payments from December 1, 1904, Sealed bids will be received for the whole or any part of this stock at the Pennsylvania Railroad offices in Philadelphia up to noon on Monday, November 28, by the Treasurer, H. Tatnall. The stock was issued under the lease of the Cleveland & Pittsburg to the Pennsylvania Co., which guarantees 4 per cent. a year.

Illinois Terminal.—The stockholders have authorized an issue of $500,000 five per cent. 20-year gold bonds, which will be issuable as follows: $200,000 to retire outstanding bonds issued January 1, 1900; $150,000 to build a line from Hartford to Edwardsville, and $150,000 for future extensions to property. The company operates 13.1 miles of terminal railroad at and near Alton, Ill., and has trackage rights over the Wabash between Edwardsville Junction and Edwardsville, 1.6 miles. Gross earnings for the year ending June 30, 1904, were $120,379 and operating expenses were $73,711, leaving net earnings of $47,468. William Elliott Smith is President and H. H. Ferguson General Manager, with headquarters at Alton, Ill.

Laramie, Hahn's Peak & Pacific.—The Isaac Van Horn Co., Boston and Cleveland, is offering $240,000 of the new 25-year first-mortgage 6 per cent. gold bonds of this company at par and interest or at 5 per cent. discount for cash. This company is building a line from Laramie, Wyo., west through Centennial to Grand Encampment, about 100 miles. The first section of the road to Centennial, 30 miles out of Laramie, is now practically completed. F. A. Miller, Laramie, Wyo., is President.

Litchfield & Madison.—At a special meeting of the stockholders on November 15, a mortgage for $1,000,000 was authorized. Of this, $750,000 bonds will be issued at once to refund a similar amount of outstanding bonds issued in May, 1903. This road is operated by the Chicago, Peoria & St. Louis, and extends from Litchfield, Ill., to Madison.

Missouri, Kansas & Texas.—Gross earnings of this company for the month of September show an increase of $300,542. Operating expenses increased only $42,166, leaving a gain in net earnings of $258,375 for the month. For the three months ending September 30, gross earnings increased $453,095 and net earnings increased $425,126.

New Hampshire Traction Company.—This company, which operates a number of electric lines in southeastern New Hampshire and extending into Massachusetts, is to be reorganized. A committee consisting of C. F. Ayer, Boston, and A. B. Foster and O. T. Barnard, New York, has submitted a plan which provides for the foreclosure of the property and the formation of a new corporation with $4,000,000 4 per cent. non-cumulative preferred stock and $4,000,000 common stock. The holders of a majority of the bonds have consented to the plan of organization. Bondholders will receive 50 per cent. in preferred and 50 per cent. in common stock, and the holders of certificates of indebtedness will receive 100 per cent. in common stock in exchange for present holdings.

New York, Westchester & Boston.—The New York State Board of Railroad Commissioners has approved the proposed increase in capital stock of this company from $1,000,000 to $20,000,000, and of a first mortgage upon the company's property for $20,000,000. The bonds will be 50-year 5 per cent. gold bonds, and the Knickerbocker Trust Co., New York, will act as trustee. This decision of the Railroad Commissioners appears to conclude in favor of this company the long struggle which has been carried on with the New York & Port Chester Company. The N. Y., W. & B. company is chartered to build a railroad from Harlem River to Port Chester, with branches from Pelham to White Plains and to Clason's Point and Throgg's Neck on Long Island Sound. The plans provide for a four-track electric railroad over a private right of way. It is stated that the attorneys for the company have already obtained a sufficient underwriting for its securities to enable it to proceed shortly with the work of construction, and they promise to soon make public the names of the real sponsors for the project. William L. Bull is President.

Pennsylvania.—Kuhn, Loeb & Co., bankers, New York, have purchased $15,000,000 40-year 3½ per cent. collateral trust certificates secured by a deposit of the stock of the Pittsburg, Fort Wayne & Chicago, and guaranteed by the Pennsylvania Railroad Co. Of the $35,580,000 collateral trust certificates outstanding, $20,000,000 were issued in 1901 to pay for the purchase of the Pennsylvania and Cambria Steel Companies. The proceeds from the sale of the certificates will be used to reimburse the company for advances made to the P., F. W. & C. road for improvements. In addition to the sale of the $15,000,000 collateral trust certificates, the company has also sold to Lee, Higginson & Co., Boston, $10,800,000 3½ per cent. equipment trust certificates.

Pere Marquette.—A special meeting of the stockholders will be held in Detroit December 19 to ratify the action of the directors in authorizing a mortgage securing $60,000, 4 per cent. 50-year gold bonds. This mortgage will take the place of the refunding mortgage securing $65,000,000 similar bonds dated July 1, 1904, which will be canceled.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY BY
THE RAILROAD GAZETTE
At 83 Fulton St., New York.

EDITORIAL ANNOUNCEMENTS:

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages and all of the advertisement pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name, Transport and Railroad Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

FRIDAY, NOVEMBER 25, 1904.

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